

## **CHAPTER TWO**

### **ALTERNATIVES INCLUDING THE PROPOSED ACTION**

#### **ALTERNATIVE DEVELOPMENT PROCESS**

The Proposed Action represents the Plan of Operations submitted by Nicore. The alternatives were developed to resolve the social and environmental issues associated with the proposal, while still meeting the Purpose and Need. Chapter Two describes the Proposed Action, No Action, and Alternatives 6, 7, 8, 9, 10 and 11, including maps. Alternative 9 is the Preferred Alternative. Chapter Two also discusses alternatives that were considered but not fully analyzed. Mitigation and monitoring requirements common to all action alternatives are discussed. Finally, Chapter Two contains a comparison of the alternatives in terms of the key indicators for the issues described in Chapter One.

#### **PROPOSED ACTION (Plan of Operations as Proposed by the Mine Claimant)**

The Proposed Action would approve the Plan of Operations as submitted by the claimant. Road access would be approved to Sites A, B, C and D. The operation would extract nickel laterite from four deposits located in Section 22, Section 8, Section 11, and Section 16 of T.40 N., R.9 W., Willamette Meridian. The areas to be mined total about 35 acres. Specific elements of the Proposed Action include:

##### **Mining Operation**

1. Each excavation site would be cleared of all organic material and topsoil (about 12 inches of soil and organic material would be set aside and stored at the mine site for use in reclamation).
2. The highest grade laterite would be excavated, screened, and loaded on trucks. Oversize material (rocks larger than 1 inch that do not pass the screen) would be returned to the bottom of the pit. Typically the oversize material would range between 40% and 60% of the volume. The average depth of the laterite is about 12 feet.
3. About 3.1 acres per year would be mined over a 10 year period.
4. The primary equipment on site would be a 2 cu. yd. excavator, mobile screening unit, dozer, and a 5 cu. yd. front end loader. Support equipment would include personnel transport and other service trucks and maintenance equipment. A fuel storage, transportation, and spill plan would be part of the final Plan of Operations.
5. The operating period would be confined to daylight hours during the dry time of year, generally between June 15 and Oct. 15.

## Haul Route

1. The haul route is shown in the ***Proposed Action Map (Figure 2)***. The map is accompanied by a legend that applies to maps for the Proposed Action and all alternatives. The total haul route would include 14.3 miles. About 7.7 miles of road would be reconstructed (widened and surfaced) and about 0.55 miles of road (0.25 miles to Mine Site B and 0.3 miles between Crossing 3 and 4) would be constructed. The existing road up “Alberg Cr.”<sup>10</sup> would be reconstructed, along with portions of all other access roads. Road design criteria are summarized here; detailed road specifications are in the Road Access Documentation Memo in the Analysis files.

\*Road grades would not exceed 25% except a few short pitches (200 feet or less) that may be up to 30%.

\*Where feasible, water bars and/or cross ditches would be “built in” for grades greater than 10%. Some annual stormproofing would also be required.

\*Road surfaces would be outsloped except on flats or on the route to Site B. The 4400-445 road to Site B would be insloped and would require drainage control structures.

\*Borrow material would be required to fill and widen some sections of the access route (roads would be designed with a 12 foot running surface). The source of this material has not been determined, but could be waste material from crushing rock surfacing (more discussion on rock surfacing is in 2. below).

\*J-holes (small turnouts) would be constructed to allow safe passage of traffic.

2. Maintenance work such as water bars, spot rocking, minor cutbank sloughs, and minor washout repair throughout the haul route would be accomplished by the miner. Rock used for road surfacing would be free of Port-Orford-cedar root disease and noxious weeds. The rock is likely to come from a source on public land within the analysis area. Any rock source, whether within or outside the analysis area, would have to be approved by the FS and BLM, and may require additional analysis before final approval.

3. The ore haul route would cross the main stem Rough and Ready Creek 6 times and would involve 10 perennial tributary crossings. All crossings would utilize washed rock fords. The rock would be carried away during high flow each winter, and new rock would be added after June 15 the next year. A year-round culvert would be placed in the “Wing and Farren” ditch.

4. The haul trucks would be 25 ton off-highway articulated dump trucks with “rough terrain” capability and a tight turning radius suitable for use on low standard roads.

5. The estimated production rate would result in approximately 3,390 round trips annually.

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<sup>10</sup>“Alberg Cr.” refers to the unnamed tributary that Road 437 follows.

## **Ore Stockpiling**

The screened laterite material would be hauled to a 5 to 10 acre area on Bureau of Land Management (BLM) lands in Section 18. The ore would be stockpiled at this site (the site would be designed to accommodate between 25,000 and 40,000 tons of ore, based on two figures provided by the proponent). The ore would be dried and eventually transported to a smelter. Highway vehicles would be used to transport the ore.

## **Reclamation**

Under the Proposed Action, about 12 inches of topsoil and organic material would be spread back over the oversized rock in the pits. The average final grade of the reclaimed pits would be about 6 feet lower than the original grade. To keep the disturbed but un-reclaimed area to a minimum, site reclamation would be kept current with the operation so no more than five acres would be open at any one time. Reclamation work would be accomplished annually prior to the winter wet season.

## **Proposed Action Map**

**See FIGURE 2**

**back of map**

## **ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY**

Several alternatives considered during this analysis were subsequently dropped from detailed study.

### **Alternatives 1-5 from the Draft Environmental Impact Statement (DEIS)**

Several alternatives considered in the DEIS were eliminated from detailed study, and replaced with the Alternatives Considered herein. Some components of Alternatives 1, 3, 4 and 5 were undesirable or did not effectively resolve issues:

*Use of Alberg Route:* DEIS Alternatives 1 and 5 utilized the Alberg route to access site A. This route would result in significant impacts to the Alberg Creek Riparian Reserve. These Alternatives would have rebuilt some of the road, and placed it away from the creek, but would still require several stream crossings and would traverse a talus slope. The ridge route better meets Standards and Guidelines and is now included in Alternatives to the Proposed Action that develop Site A.

*Use of Culverts and Fill at Rough and Ready Crossings:* DEIS Alternatives 1, 3, and 4 utilized culverts at Crossings #1-#7. This crossing design would have facilitated fish passage but would have resulted in greater risks to Sediment Delivery, Hazardous Fluid Spills, and PETS Fish than seasonal bridges. Culverts at Crossings #1-#7 are not proposed in any SDEIS alternative.<sup>11</sup> Other elements of DEIS Alternatives 1-5 were carried forward.

### **An Alternative that would withdraw the some or all of Rough and Ready Creek watershed from mineral entry.**

Several commenters have suggested/demanded mineral withdrawal of some or all the South Kalmiopsis Roadless Area. This action is being considered by the FS and BLM. Federal agencies may apply for administrative withdrawals given a wide range of “public purposes”<sup>12</sup>. The FS and/or BLM could recommend withdrawal based on the area’s environmental sensitivity. However, such a recommendation would not meet the Purpose and Need for Action<sup>13</sup> as stated in Chapter One, and would be outside the scope of project level analysis. A withdrawal would not affect valid, existing claims. A mining claim is assumed valid until otherwise proven. Therefore, analysis of the proposed Plan of Operation would still be required in the near term. Details about the withdrawal and validity examination process are in the analysis files.

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<sup>11</sup>Culverts are proposed for other tributary crossings in Alternatives 6-11.

<sup>12</sup>See BLM manual supplement 2310 and FS manual 2700-90-1. The BLM is responsible for processing all withdrawal requests.

<sup>13</sup>Purpose - to determine reasonable mitigation, Need - to respond to a claimant’s Plan of Operations.

**An Alternative that would recommend that the Rough and Ready Watershed be made into a National Conservation Area, a Designated Special Research Area, a Port-Orford-cedar Sanctuary or the Redrock Rainforest National Monument.**

Many of the letters requesting mineral withdrawal also recommended that the Rough and Ready Watershed (or South Kalmiopsis Roadless Area) be made into a National Conservation Area or other designation. These recommendation are beyond the scope of this analysis and would not meet the Purpose and Need for Action. Congress would be responsible for taking this type of action.

**An Alternative that requires mineral examinations to prove the validity of the claims prior to approving a Plan of Operations**

Many people (including some members of Congress - see Appendix B) suggested the Agencies challenge the validity of the mining claims covered in the Plan of Operations. They requested that mineral examinations be completed prior to approving any Plan of Operations. The Forest Service does not initiate a mineral examination unless the locator proposes to conduct mining in an area that has been withdrawn from mining or as part of the patent process. The claims covered in the proposed Plan of Operations would be examined if the moratorium on processing patent applications was lifted. The range of alternatives is satisfied with No Action representing an alternative that does not approve any mining and future mineral examination possible as part of the patent process. Alternative 9 requires more information be generated before full scale mining or road development is approved. The suggested alternative was not developed since it is not consistent with Forest Service policy and No Action and Alternative 9 would have similar impacts.

**An Alternative that considers helicopter ore haul for full scale mining**

An alternative that eliminates all road improvement and requires access from the air for full scale mining (400,000 tons) was considered but eliminated from detailed study. Such an alternative would be extremely expensive to implement and may be tantamount to denial of access. This SDEIS fully considers Alternative 9, which approves limited sampling (up to 5,000 tons of ore could be removed using helicopters) without significant road improvement.

**An Alternative that “buys out” the claims**

Some people suggested that the agencies purchase the claims. Such an alternative would not meet the Purpose and Need as described in Chapter One.

**An Alternative that would import off-site fill and/or soil to assure revegetation of mine pits**

Use of off-site materials (fill and topsoil) to assure revegetation of mine pits was considered. Potential adverse effects of use of such materials are likely to be greater than the benefits of using them. Import of soil could require more round trips along the access route and attendant crossings of Rough and Ready Creek. Imported material would have an increased risk of spread of noxious weeds or non-native vegetation.

### **An Alternative that would close roads within the Analysis Area**

Closure of all or most roads on federal lands in the Analysis Area was proposed by some members of the public. The EIS acknowledges that some existing roads do not currently meet all proposed Road Management Objectives (RMOs). Many low-standard roads in the area were constructed for minerals access and are not safe for public travel. However, consideration of the long term need for these roads is dependent on what alternative is selected in the Nicore EIS, and future needs. Given these needs, roads may be improved, treated or closed, under a separate analysis that focuses on watershed restoration. A Botanical Area Management Plan is in the works and is likely to contain some decisions about access.

### **An Alternative that would address watershed restoration needs without mining**

Some members of the public believe the Nicore EIS would be an appropriate vehicle to decide on restoration projects that would occur without any Plan of Operations approved. Such an alternative does not meet the Purpose and Need. The selection of any alternative (including No Action) does not preclude future actions taken to maintain or restore the watershed.

### **An Alternative that would analyze mining claims outside than the 35 acres proposed**

Some people suggested that this EIS analyze an alternative that would approve mining on other, more accessible claims held by the mine proponent. The mining proponent has not indicated specific interest in mining areas outside of the deposits shown in Figure 13, all of which have similar access requirements. The alternatives already considered provide a full range of access options from helicopter sampling to four miles of road construction and six miles of reconstruction.

### **An Alternative that would require the stockpile site to be placed off of federal lands, or outside of the Area of Critical Environmental Concern**

The stockpile site contemplated in Alternatives 6 through 11 are along the haul route on mining claims owned by the mine claimant. Stockpiling is an acceptable use of the mining claims at this location. The site selection and other stipulations effectively resolves issues related to stockpiling (see Mitigation discussion in this Chapter).

### **An Alternative that uses cable (tram) access from Mine Site C to avoid stream crossings.**

This alternative was not considered because the economical and operational feasibility of cable ore haul is uncertain. Alternatives 10 and 11 use a cable system to avoid several miles of roads within riparian reserves, multiple stream crossings, and several rare plant sites. Site C can be accessed with one stream crossing. The feasibility of the cable system to C has not been studied, but is certain to be extremely expensive. The Preferred Alternative 9 completely avoids stream crossings.



## Sequencing of Activities

Some people suggested that mining impacts could be minimized by requiring that ore be removed from each sample site and the roads closed prior to work on the next site. This option was not developed because the miner has stated that, at least in the initial phase of the operation, ore must be sampled from all sites so a prototype processing operation can be developed (November 1993 POO modification memo in analysis files). Completion of each site before entering the next would reduce the impacts of road use and would likely be more cost-effective than operating at multiple sites concurrently. The Proposed Action and all alternatives do require reclamation be completed annually. No more than five acres would be unreclaimed at any one time. Roads would be stormproofed annually in full mining alternatives.

## NO ACTION

The No Action alternative would not approve the Nicore Plan of Operations. Roads would not be constructed, reconstructed, or maintained. ***Figure 3 shows the existing mapped roads within the analysis area.*** The Forest Service has proposed Road Management Objectives for many of these roads (road management objectives are summarized in Chapter Three with further information in the Analysis Files). Treatments to meet these objectives would not occur under this decision, but would be considered as a part of regular Forest Service watershed restoration program. Chapters Three and Four, and the Summary of Environmental Effects later in this Chapter provide more detail about the conditions that would continue under the No Action Alternative.

**No Action Map**

**[See FIGURE 3](#)**

back of map

## **MITIGATION INCLUDED IN ALTERNATIVES TO THE PROPOSED ACTION**

Alternatives 6 through 11 would include the following mitigation to minimize adverse effects and meet laws, regulations, standards and guidelines:

### **PERMITS**

**Goal:** To assure all appropriate agency permits are in place before mining operations begin.

All necessary permits would be obtained from applicable state, federal, or other agencies prior to beginning operations annually. Permits that may be required include (but are not limited to):

- a) Oregon Department of Environmental Quality (DEQ) - National Pollutant Discharge Elimination System Permit;
- b) Oregon Department of Environmental Quality - Water Pollution Control Facility Permit;
- c) Oregon Department of Environmental Quality - Crushing/Screening Permit
- d) Oregon Division of State Lands - General Authorization Permit;
- e) Oregon Division of State Lands - Removal/Fill Permit;
- f) Oregon Department of Geology and Mineral Industries Operating Permit
- g) Oregon State Water Master Permit to Withdraw Water from Rough and Ready Creek (for use in dust abatement and other road activities).
- h) Oregon Department of Transportation Permit for Highway 199 Access.

Not all permits would necessarily be required for all alternatives.

**Cost:** The costs of these permits ranges between \$2,000 and \$10,000 the first year, with additional fees (less than \$1,000) required annually. The Oregon Department of Environmental Quality - National Pollutant Discharge Elimination System Permit (DEQ-NPDES) could bring the cost up to \$10,000 if an individual permit is necessary. It would cost closer to \$2,000 if a general permit would suffice. This decision is not made until the miner submits a permit application to DEQ.

**Effectiveness:** The proponent is responsible for obtaining all necessary permits and alerting Agencies prior to annual start-up. Obtaining a permit does not necessarily mean an operator would comply with stipulations in the permit. Routine and random inspections and monitoring reports are necessary to assure compliance.

### **PROCESSING FACILITY**

**Goal:** To reduce the potential for unnecessary damage to surface resources.

Under all alternatives, no Plan of Operations would be approved without a processing facility identified and any further analysis required is completed. Under Alternative 9, a test plant would have to be built, or other processing facility identified, prior to POO approval.

**Cost:** No immediate cost. Cost of future analysis to approve the Plan of Operations would depend on the facility proposed.

**Effectiveness:** Highly effective way to eliminate surface disturbance before a processing facility is identified. Some uncertainty in the economic viability of the Proposed Action and all the alternatives would be mitigated by evidence that a processing facility exists that would handle the ore in the amounts proposed.

## **RECLAMATION**

**Goal:** To assure disturbance of mine and stockpile sites are minimized, and to assure that roads are treated properly when they are no longer needed for mining. A reclamation plan detailing *how* reclamation would be accomplished is a required part of the Plan of Operations and must be completed prior to final approval. Reclamation objectives include:

**a) *Reclamation Bond:*** A reclamation bond would be required in all action alternatives. If the operator fails to meet requirements, the bond would cover costs related to annual and/or final reclamation of the mine sites, stockpile site, and project roads.

**Cost:** Estimated as \$50,000, developed by the Oregon Department of Geology and Mineral Industries along with the FS and BLM.

**Effectiveness:** A bond is a highly effective way to assure that the reclamation is accomplished in a timely manner.

**b) *Drainage and erosion control at the stockpile and mine sites:*** **Geophysical technical modeling (contracted by the proponent) for slope stability** is recommended in alternatives that include pit development at Mine Site D. Reclamation of the mining pits is not expected to include extensive re-contouring (thus disturbing surrounding lands). The topography at the reclaimed pits would be required to be uneven to reduce risk of erosion. The top foot of soil at all mine sites would be set aside and used to provide a growing medium for native plants. For all mining sites and the stockpile site, the proponent would be required to contract with a Certified Engineer to design drainage an exit point that is armored and does not drain toward any streams or unstable slopes. Reclamation of all disturbed mine sites would occur during each year's operating season.

**Cost:** Approximately \$10,000.

**Effectiveness:** Mine pits are likely to remain as depressions. Erosion associated with the pits is not likely to exceed a few yards per year. Rainwater may saturate the soil/rock in the pits at some times of the year.

**c) Restoration of native vegetation at mine sites and stockpile site:** Natural regeneration is expected to occur over time.<sup>14</sup> Regeneration is unlikely to be hastened significantly, but some seeding and planting could help short-term restoration. Native seed would be required for revegetation (seed would come from areas at or near the mine and stockpile sites and would have to be collected the year before they are spread).<sup>15</sup> Soil amendments (mulch, fertilizer) may be recommended on a small scale. Some planting may be required, but in quantities are expected to be small. Minimum disturbance would be emphasized in all alternatives.

Specific revegetation prescriptions would be developed by knowledgeable plant resource specialists and would respond to post-mining/stockpiling conditions. Prescriptions would be subject to FS and BLM approval. Non-motorized or helicopter access may be required to plant or scatter seeds on reclaimed mine sites during the off-season (September or October 15 to June 15). The stockpile site may require mechanical treatment for compaction prior to revegetation. Any vegetation cleared at mine sites or along roads would be retained for later use in reclamation (cut vegetation would be placed on top of the ground to supply nutrients and achieve erosion control).

**Cost:** Seed collection and scattering is estimated to cost about \$500/acre.

**Effectiveness:** Complete restoration of vegetation at the mine pits and stockpile site is not expected in the short term. Natural revegetation is likely to occur on the most favorable sites; with some sites more difficult to reclaim. Natural regeneration of disturbed mine sites has been observed.

**d) Stormproofing and erosion control along the haul route:** Detailed annual maintenance and stormproofing guidelines, including the use of drainage dips and waterbars, are in the analysis files. Vegetation removed during road, mine or stockpile site development may be used for road development activities, as approved by the FS and BLM. Annual and final reclamation could include requiring earthen barriers and ripping the first quarter mile of the road surface to eliminate future road use. Vegetation removed in operations (mine pit, stockpile site, road development) may also be used for erosion control on roads. During storms, when water is actually running on the road surface, all haul would be suspended to reduce sedimentation.

Road Management Objectives (RMOs - further discussion elsewhere in the FEIS) for National Forest roads were reviewed as part of the project analysis. The project area is largely inaccessible due to road condition, fords not maintained, and a gate on the private road. The objective for many roads would eliminate motorized vehicles except when specifically approved for mining access. Treatments on roads approved for mining access would be funded by the miner. Treatments on roads not included in approved Plan of Operations would likely be funded through the Forest Service watershed restoration program.

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<sup>14</sup>Previously disturbed areas show a range of conditions, some areas have literally no evidence of natural revegetation, others have sparse populations of herbaceous species and small trees.

<sup>15</sup>FS policy for the Pacific Northwest states that to the extent practicable, seeds and plants used in erosion control...and other vegetation projects shall originate from genetically local sources of native plants. Further guidance is given in the Siskiyou National Forest Plan Minerals Standard and Guideline 10-7, which requires use of natural vegetation in restoration.

**Cost:** The cost of annual road stormproofing and closure is estimated as \$200/mile.

**Effectiveness:** Stormproofing is an effective method of reducing sedimentation from roads. Road closures can reduce or eliminate traffic but are sometimes breached. Earthen barriers and ripping road entries are very effective closure methods. Access would continue to be limited by the high flows, since crossing structures would be removed annually.

***e) Clean-up of Mine and Stockpile Sites:*** All work areas would be kept clean at all times. Refuse would be regularly removed from federal lands. The operator would contact the Agencies immediately prior to seasonal shutdown and before equipment removal to allow for site inspection and annual reclamation measures (36 CFR 228.10).

**Cost:** Regular clean up is part of the operating costs displayed in Chapter Four. The reclamation bond is expected to be sufficient to remove all equipment, supplies, refuse, etc. from federal lands.

**Effectiveness:** Very effective, since compliance is mandatory under an approved Plan of Operations.

## **ORE STOCKPILING**

**Goal:** To ensure that stockpile site meets criteria set by the BLM.

An alternative stockpile site is proposed for Alternatives 6-11. This site is:

- a) outside riparian reserves (to meet Northwest Forest Plan Guideline MM-2);
- b) hidden from Botanical Wayside, proposed Interpretive Trail viewpoints and Hwy 199;
- c) avoids special status plants and unique habitats (site has been previously disturbed);
- d) limited to 10 acres (Alternative 9 would require about 10 acres for helicopter operations; other sites would likely not exceed 5 acres).
- e) no more than 40,000 tons of ore would be stockpiled at any one time.
- f) piles would be covered by a canvas cloth to prevent erosion.
- g) stockpile site would be designed for grade and drainage control.

The power line route between Highway 199 and the alternative stockpile site ( about 0.75 miles) would be improved to accommodate highway-legal haul vehicles in all action alternatives (including 9). Some improvement at the intersection of the power line and the Highway would be expected.

A temporary Watchman's Quarters would be approved as needed to provide security at the stockpile site. Adequate sanitation facilities would also be required. For Alternative 9, at least part of the stockpile site would be over 100 yards from the power line and designed to accommodate helicopter operations, including clearing of approaches. The helicopter most likely would be serviced, housed and fueled at the Illinois Valley Airport, although the stockpile site could also be used.

**Cost:** Some of the costs to develop the stockpile site are part of the cost of operations discussed in Chapter Four. However, vegetation clearing costs were not included and could exceed \$500 per acre.

**Effectiveness:** The alternative stockpile site is an appropriate use of BLM lands, given an Approved Mining Plan of Operations.

## **ROAD CONSTRUCTION, RECONSTRUCTION, and IMPROVEMENT**

**Goal:** To assure roads are safe for intended uses and are designed to minimize adverse effects.

Road specifications are summarized previously in the description of the Proposed Action and are detailed in the Road Access Documentation in Appendix K. Road development would be designed to meet all BLM and FS standards, including Road Management guidelines in the Northwest Forest Plan.<sup>16</sup> The following Best Management Practices would be incorporated into all aspects of road work and project design. Some of the BMPs listed address topics that are also discussed throughout this EIS.

- M-2. Administering Terms of BLM Permits or Leases**
- R-1. General Guidelines for the Location and Design of Roads**
- R-2. Erosion Control Plan**
- R-3. Timing of Construction Activities**
- R-4. Road Slope Stabilization (Planning)**
- R-5. Road Slope and Waste Area Stabilization (Preventive)**
- R-6. Dispersion of Subsurface Drainage Associated with Roads**
- R-7. Control of Surface Road Drainage Associated with Roads**
- R-8. Constraints Related to Pioneer Road Construction**
- R-9. Timely Erosion Control Measures on Incomplete Roads and Stream Crossing Projects.**
- R-10. Construction of Stable Embankments (Fills)**
- R-11. Control of Sidecast Material**
- R-12. Control of Construction in Streamside Management Units**
- R-13. Diversion of Flows Around Construction Sites**
- R-14. Bridge and Culvert Installation**
- R-15. Disposal of Right-of-Way and Roadside Debris**
- R-17. Water Source Development Consistent With Water Quality Protection**
- R-18. Maintenance of Roads**
- R-19. Road Surface Treatment to Prevent Loss of Materials**
- R-20. Traffic Control During Wet Periods**
- R-22. Restoration of Borrow Pits and Quarries**
- R-23. Obliteration of Temporary Roads and Landings**
- W-3. Protection of Wetlands**
- W-4. Oil and Hazardous Substance Spill Contingency Plan and Spill Prevention Control & Countermeasure (SPCC) Plan**
- W-6. Control of Activities Under Special Use Permit**
- W-7. Water Quality Monitoring**
- W-8. Management by Closure to Use (Seasonal, Temporary, and Permanent)**
- M-1. Water Resources Protection on Locatable Minerals Operations**
- VM-3. Revegetation of Surface Disturbed Areas**

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<sup>16</sup>Some alternatives do not meet ALL aspects of the Standards and Guidelines. See Chapter Four Analysis regarding the Aquatic Conservation Strategy and Riparian Reserve Standards and Guidelines for more information.



Rock needed for road development (generally surfacing) would come from sources free of Port-Orford-cedar root disease and weeds. Rock native to the vicinity would be preferred. Rock would be subject to approval by the Agencies. Within the analysis area there are three sites on BLM and one site on private lands suitable for use in road development (these are indicated on a map in the analysis file and described in the Road Access Documentation in Appendix K).

Mitigation to reduce rock fall into Rough and Ready Creek from Bench Road Construction would include rock blankets to reduce airborne fragments during blasting, log cribs to catch rock fall, and special drilling and loading of powder to reduce overall movement and airborne fragments.

**Cost:** Cost of road development varies by alternative and is displayed in Chapter Four.

**Effectiveness:** Adherence to road development specifications can be tightly administrated and is a mandatory part of any authorized Plan of Operations. For each BMP, a detailed description, estimate of effectiveness and monitoring recommendations are in the analysis files. Methods to reduce rock fall have proven very effective on other projects.

## **FUEL TRANSPORTATION, STORAGE AND SPILL PLAN**

**Goal:** To assure safe fuel storage and transportation. To clarify procedures in the event of a fuel or other hazardous material spill, to protect water quality and human health.

All alternatives require a Fuel Transportation, Storage and Spill Contingency Plan as part of the approved Plan of Operations. The proponent would be responsible for preparing an adequate plan that meets all regulations. The plan would describe the equipment needed on site for sponging up or limited flow of spills in waterways. Communications in each vehicle would be planned to assure quick response to spills. Holding areas would be designed for storage of petroleum products if 660 gallon containers (or larger) are used. Best Management Practices W-4 mentioned above provide additional guidance for the spill plan.

**Cost:** The cost of prevention is minuscule compared to the cost of a clean-up. The reclamation bond is expected to cover clean-up costs in the event of a spill.

**Effectiveness:** Adherence to the Plan of Operations, including fuel transportation and storage and spill planning, is mandatory. The operator can be shut down for non-compliance and the reclamation bond used to clean up any spills.

## **PORT-ORFORD-CEDAR ROOT DISEASE CONTAINMENT**

**Goal:** To reduce the risk of introduction of Port-Orford-cedar root disease from operations.

All action alternatives would include a Port-Orford-Cedar (POC) Root Disease Containment Strategy, aimed at reducing the risk of introduction of root disease into the project area. These actions are guided by Siskiyou National Forest Management Goals, Standard and Guidelines (see S&G 12-8), and the Aquatic Conservation Strategy Objectives 8 and 9. Disease control measures considered include:

-a wash station equipped with high pressure water equal to or greater than 125 psi through a quarter inch nozzle and adequate drainage. The wash station may as far away as in Cave Junction.

-equipment would have to be washed before operations begin or if the equipment works elsewhere and returns mid-season

-Water used for washing vehicles would come from a clean source (as defined by the Forest Service/BLM) or would be treated with clorox.

-Road construction, improvement and haul would be done during the dry season (June 15 through October 15 - work on the north side of Rough and Ready Creek would not occur after September 15 except under the Proposed Action and Alternative 11). No wet season operation. Suspend haul during dry season storms if roads become muddy.

-Road specifications would establish and maintain an inslope road template and berms to prevent downslope flow (as topography and site conditions allow).'

-Clean sources of rock would be required for road surfacing (as defined by the Agencies).

-Road improvement specifications consider adding rock to wet spots.

-Where possible, coordinate prevention and disease control activities with adjacent landowners and Agencies.

-Roadside Sanitation of POC (Removing POC from within 25 feet of roads)

-Lifting and paving of the roadway 50 feet on either side of infested areas near the West Fork Illinois River (applies only to Alternative 10).

A specific containment strategy for the Preferred Alternative 9 is Appendix J.

**Cost:** Costs would be in the thousands of dollars to implement the disease control strategy for any alternative.

**Effectiveness:** The Disease Control Strategy is based on the best available research, however effectiveness of the any one of the disease control strategies is uncertain. A range-wide study of Port-Orford-cedar and disease control strategies is underway and would include information about effectiveness of the treatments. These treatments, used in combination and with consistency, should effectively reduce the risk of introducing the disease from this operation. However, there would be a remaining risk regardless of alternative selected.

## **RESTRICTIONS ON ROAD USE**

Goal: To provide for worker and public safety and reduce risk of resource damage.

Project access roads would be gated to restrict vehicular traffic. Specific gate locations would be established by the Forest Service. Motorized access beyond the closures would be restricted to mining operations and administration. Motorized access to the north side of Rough and Ready Creek would be prohibited between September 15 and June 15 annually in all Alternatives except for 9 and 11. Alternatives 9 and 11 would allow access until October 15.

Alternative 9 would also require restrictions on non-motorized use of affected areas during helicopter operations. The proponent would be required to assure that the public is aware of the closures and remain out of the area (flaggers at popular spots such as the road to Mars Swimming Hole would likely be required).

For all alternatives, stop signs, speed limits, dust abatement, or other traffic control methods may be employed. The proponent would be required to submit an annual road safety plan, subject to Forest Service and BLM approval. Vehicles used on county and state roads would be required to meet all laws and regulations. Communications between ore haul vehicles (CB radio, for instance) would be desirable.

**Cost:** Costs for gates are displayed in Chapter Four. During helicopter operations, additional costs would be incurred to notify and stop people from entering the area.

**Effectiveness:** Moderate. Closures certainly reduce traffic, but sometimes can be breached. Location, design, monitoring and administration of the closures are keys to effectiveness. Administration of traffic control during operations is likely to be effective.

## **NOISE CONTROL**

**Goal:** To assure that noise generated from the mining operation does not exceed state thresholds.

Operations (including mining, ore haul, helicopter use, stockpile operations) would be limited to the hours of 7AM and 7PM, excluding Sundays and holidays, when no operations would be approved. The operator would be responsible to establish a baseline for ambient noise levels, and to monitor noise generated from the project to assure that applicable state standards are met. Vehicles used on county and state roads would be required to be entirely highway legal in terms of weight, size, noise emission and other applicable state standards. Helicopters would remain at least 1000 feet (vertical and horizontal distances) from any residences.

**Cost:** Very low.

**Effectiveness:** Limits on operating periods and vehicles are easy to administrate.

## **DUST ABATEMENT**

**Goal:** To provide for traffic safety and air quality and reduce visual impacts.

Dust abatement would be required on portions of the haul route, mine sites, and stockpile site. Several methods of dust abatement may be approved (see Road Access Documentation in the project file). Any dust abatement method would have to meet all federal and state laws and would be subject to Forest Service and BLM approval.

**Cost:** The cost of dust abatement is estimated in the cost of operations displayed in Chapter Four.

**Effectiveness:** High. Dust abatement is commonly used in Forest operations.

## **FISHERIES**

**Goal:** To assure fish migration is not impeded by the operation, and assure that state and federal recommendations regarding in-stream activities are met.

Seasonal bridges at major crossings and seasonal culverts at smaller tributaries are key components within most alternatives (see Alternative discussions and Figure 11, Alternative Comparison Chart). Seasonal bridges would be designed to facilitate salmonid migration. Seasonal bridges and/or culverts would be placed in creeks on or after June 15 and removed by September 15 annually, per in-stream work restrictions recommended by the Oregon Department of Fish and Wildlife and the National Marine Fisheries Service. Crossing construction material, including fill, would be stockpiled during the off-season out of the high water channel in a location approved by the Forest Service. Crossings #2, #3, and #4 would be eliminated.

**Cost:** The cost of removal and replacement of crossing structures is part of the Cost of Operations displayed in Chapter Four. Elimination of three crossings proposed in the Plan of Operations submitted by the miner would reduce crossing costs, but would require road construction (see Chapter Four for comparisons between alternatives). Reducing the operating season by one month per year would not cost more money per se, but might require more ore haul trucks or personnel to meet production goals during the operating season.

**Effectiveness:** High. Limits on operating season are easy to enforce.

## **SENSITIVE PLANTS, UNUSUAL HABITATS AND NOXIOUS WEEDS**

**Goal:** Reduce impacts on PETS plant species.

To the extent possible, sensitive plants and unusual habitats (including unoccupied habitat for *Arabis macdonaldiana*) would be avoided in final road location and mine pit design. Off-road vehicle use would not be approved. Equipment would be restricted to specified locations. Rock and soil removed in road construction or reconstruction activities would be piled on existing roads or other specified areas; this material may be used to backfill mine pits. Tailings or other material would not be piled on rare plant areas (these would be flagged by FS or BLM personnel prior to ground disturbance).

Bulbs of *Calochortus howellii* that may be affected by the proposal would be harvested and replanted at a suitable location. Direct impacts on fens would be avoided.

The proponent would also be responsible for noxious weed control at the mine sites, stockpile site, and along the haul route. Risk of noxious weed introduction would be reduced through the POC Root Disease mitigation described previously; vehicle and equipment washing prior to entering the area, and weed free rock would be required in road improvement.

Scotch broom growing along the Wimer road should be removed (cooperation with the county and private land owners would be necessary) to prevent spread of this species to the Oregon Mountain Botanical Area, the access road to mining site B, and the Rough and Ready Creek watershed.

**Cost:** Cost of road improvement is discussed in Chapter Four. Cost of *calochortus* replanting is expected to cost less than \$1000. Cost of noxious weed eradication would vary depending on how well prevention strategies were implemented.

**Effectiveness:** Direct impacts to fens are likely to be avoided. Some rare plants and their habitat would be disturbed in all action alternatives (see Chapter Four for details). Mine administration would assure that off-road vehicle use does not occur during the operating season and that materials are piled in appropriated places.

Noxious weed control is best achieved through prevention. Once noxious weeds are established, they are difficult to control. Some risk of noxious weed introduction would remain regardless of how well prevention methods are applied. The effectiveness of transplanting *calochortus* bulbs is unknown and was suggested by a prominent botanist (Dr. Frank Lang).

## **SANITATION FACILITIES**

**Goal:** To protect worker safety and water quality.

Adequate sanitation facilities would be required at all work sites. The proponent would prepare a sanitation plan subject to FS and BLM approval as part of the final Plan of Operations.

**Cost:** Sanitation needs area not expected to exceed \$5000.

**Effectiveness:** Very effective.

## **MONITORING**

Environmental monitoring programs that meet the requirements of all permitting agencies would be implemented as part of any action alternative and would be developed prior to final project approval and would be part of the final Plan of Operations. Monitoring programs would be designed to quantify and measure environmental impacts accompanying construction, operation, reclamation and post-closure condition of the analysis area, with reference to pre-operational data obtained during baseline monitoring. Impacts that result in violations of regulatory stipulations would require changes in the way the project is implemented, including additional mitigating measures.

The proponent would be required to submit an annual report detailing monitoring data, interpretation and changes indicated by the monitoring results. However, if a regulatory threshold is exceeded, it must be brought to the attention of all appropriate agencies within 30-days (unless a shorter time frame is indicated through regulations, such as a hazardous substance spill).

Monitoring would also be achieved through random or routine inspections by permitting agencies. The operator may be required to fund monitoring by the agencies (or an impartial third party), particularly if monitoring results reported by the miner do not match results reported by the agencies.

At a minimum, monitoring would consist of the following elements:

## **Adherence to Plan Of Operations**

The operator would be responsible for daily inspections and reports regarding adherence to stipulations in the Plan of Operations. The permitting agencies would also provide regular and random inspections.

## **Water Quality**

**Surface Water Chemistry:** Surface water was sampled and analyzed by the United States Geological Survey (USGS - summarized in Chapter Three, full report in the analysis files). This data can be used as a baseline for comparison for samples taken during and following operations.

**Stream Temperature:** Stream temperature monitoring is an ongoing Forest Service activity (contingent on funding). The agencies are expected to continue to do this monitoring.

**Ground Water Chemistry:** The Forest Service has sampled several springs downslope of Mine Site B to provide baseline data to compare to samples taken during and following operations. The operator would also be responsible for obtaining well samples within the analysis area pre- and post- operations.

**Accidental Spills:** The approved monitoring plan would provide for effects analysis following any accidental spill.

## **Fisheries**

Baseline data for fish habitat condition, species present, population size and distribution has been established through stream surveys, which currently are on an 8 to 10 year survey interval, contingent on funding. Federal and state agencies are expected to continue the stream survey program.

## **Port-Orford-cedar**

The operator would be required to report any incidence of dead or dying Port-Orford-cedar within the mine and stockpiles sites and along the haul routes. Adherence to the POC Root Disease Containment Strategy would be a requirement of the Plan of Operations. Daily and random inspections would occur to assure requirements are met. POC monitoring would also occur Forest-wide as part of the regular Forest monitoring program.

## **Noxious Weeds**

The operator would be required to report any incidence of noxious weeds within the mine and stockpiles sites and along the haul routes. Noxious weed eradication would follow any reports.

## **Sensitive Plants**

The presence, distribution, and abundance of sensitive plants along the haul route would be surveyed on a regular (multi-year interval) basis. Long-term plots may be established to determine effects on individuals or groups of individuals deemed prone to disturbance.

## **Effects on Residents**

Ambient and operation generated noise levels would be measured and recorded before and during operations. Noise levels and operating times of “equipment, facilities, operations and activities” would be reported as per OAR-34-035 (3) and (4). The requirement for such monitoring can be suspended when compliance is demonstrated to the satisfaction of the administering Forest Service Officer.

## **Air Quality**

An air quality monitoring station has been established near the analysis area at the Illinois Valley Airport. Oregon Department of Environmental Quality, in cooperation with the Forest Service, provides ongoing data collection from the monitoring station.

## **Wildlife**

Sightings of any PETS wildlife species should be reported to the District Wildlife Biologist (the miner would be provided with a list of PETS species). Macro-invertebrate sampling would be required for all alternatives that include road haul.

## **ACTION ALTERNATIVES CONSIDERED**

### **ALTERNATIVE 6 - Private Road, Ridge Route, Seasonal Bridges**

Alternative 6 would approve road access to Sites A, B, C and D. It would require the mine claimant to make a reasonable effort to secure access via the existing private road<sup>17</sup>. Mine Site A would be accessed via the Ridge Route (The Ridge Route is 3.5 miles new construction). *Figure 4 shows the Alternative 6 haul route.* For the purposes of this analysis, the private road would be widened and paved to mitigate for noise, dust, and safety.<sup>18</sup> Use of the existing private road would eliminate the need for four crossings of the main stem of Rough and Ready Creek. Seasonal bridges would be required at Crossings #5, #6, and #7. Culverts would be placed at two tributary crossings; these would be removed and replaced annually. A year-round culvert would be placed at the National Forest boundary just beyond the Rough and Ready Creek road.

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<sup>17</sup>If access cannot be secured by the claimant, the FS would be required to provide access via federal land.

<sup>18</sup>The Forest Service may choose an alternative that requires the claimant to attempt to secure access through the private land, but does not have the authority to regulate the road design criteria.

Alternative 6 would require approximately 3.8 miles new road construction and 6.1 miles reconstruction.<sup>19</sup> Total haul route is about 15.5 miles. The entire haul route would be designed to accommodate street legal haul vehicles. Mitigation described in the Proposed Action and additional mitigation included for all action alternatives would apply to Alternative 6. It would approve the alternative stockpile site.

#### **ALTERNATIVE 7 - Bench Road Construction, Ridge Route, Seasonal Bridges**

Alternative 7 would provide road access to Sites A, B, C and D. It would construct 0.4 miles of road construction on the north side of Rough and Ready Creek. This road would require full bench construction through a steep peridotite rock outcrop. Mine Site A would be accessed via the Ridge Route. The haul route to Sites B and D are otherwise the same as the Proposed Action. Seasonal bridges would be required at Crossings #1 #5, #6, and #7. Culverts would be placed at two tributary crossings. These would be removed and replaced annually. A year-round culvert would be placed at the Wing and Farren ditch. *Figure 5 shows the Alternative 7 haul route.*

Alternative 7 would require approximately 4.2 miles new road construction and 5.5 miles reconstruction. Total haul route is about 15.4 miles. Mitigation described in the Proposed Action and additional mitigation included for all action alternatives would apply to Alternative 7. It would approve the alternative stockpile site.

#### **ALTERNATIVE 8 - Bench Road Construction, Ridge Route, Seasonal Bridges, No “D”**

Alternative 8 would approve road access to Sites A, B, and C but would eliminate access to site D. It would construct 0.4 miles of new road on the north side of Rough and Ready Creek. This road would require full bench construction through a steep peridotite rock outcrop. Mine Site A would be accessed via the Ridge Route. The haul route to Site B is otherwise the same as the Proposed Action. Seasonal bridges would be required at Crossings #1 and #5. Culverts would be placed at two tributary crossings. These would be removed and replaced annually. A year-round culvert would be placed at the Wing and Farren ditch. *Figure 6 shows the Alternative 8 haul route.*

Alternative 8 would require approximately 4.2 miles new road construction and 4.9 miles reconstruction.<sup>20</sup> Total haul route is about 13.3 miles. Mitigation described in the Proposed Action and additional mitigation included for all action alternatives would apply to Alternative 8. It would approve the alternative stockpile site.

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<sup>19</sup>Miles of road construction in Alternatives 6, 7 and 8 have increased since the SDEIS because the 1.6 mile stretch of the Mendenhall Fireline is no longer considered an existing road. Miles of reconstruction have been reduced by 1.6 miles to account for this change.

<sup>20</sup>Miles of road construction in Alternatives 6, 7 and 8 have increased since the SDEIS because the 1.6 mile stretch of the Mendenhall Fireline is not considered an existing road. Miles of reconstruction have been reduced by 1.6 miles to account for this change.



## **Alternative 6**

**See FIGURE 4**

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**Alternative 7**

**See FIGURE 5**

**back of 7**

## **Alternative 8**

**See FIGURE 6**

**back of 8**

## **ALTERNATIVE 9 - PREFERRED - Limited Road Access, Helicopter Sampling**

Alternative 9 would allow sampling of mine sites A, B, C, and/or D. This alternative would require Nicore to sample 5,000 tons of ore from the mine sites. Sampled ore would be hauled in helicopter buckets. Figure 7 shows the amount ore from each mine site, the number of trips and total time required to haul that ore, the number of trips estimated to haul equipment, and the number of trips estimated to haul personnel for each site. All totaled, about 124 hours of flight time would be required to haul 5,000 tons of ore and other trips.

	<b>Mine Site A</b>	<b>Mine Site B</b>	<b>Mine Site C</b>	<b>Mine Site D</b>
Area Mined	0.2 Acres (about 8700 sq feet)	0.2 Acres (about 8700 sq feet)	0.03 Acres (about 1360 sq feet)	0.03 Acres (about 1360 sq feet)
Tonnage of Ore	2,143	2,143	357	357
Flight Time - Hours to Haul	60.33	44.48	3.73	9.07
Number of Trips to Haul	286	286	48	48
Additional Trips (Equipment and Personnel)	15	13	8	10

**Figure 7. Information related to Helicopter Sample Sites Proposed in Alternative 9.**

No significant road improvement would be approved. The miner could walk tracked vehicles (such as a backhoe) to Mine Site B up Road 461 (“the Rock Creek Road), however equipment would have to be flown to the other mine sites. The Rock Creek road would not be approved for daily travel with personnel vehicles. No stream crossings for any vehicle would be approved.

Sampling would be limited to approved sites where surveys have determined that PETS and Survey and Manage Species can be avoided. All of the mine sites have been previously sampled, and this alternative would limit disturbance to previously sampled areas. The mine pits themselves would disturb less than one acre total (approximately 0.2 acres per mine site).

Alternative 9 would require the miner to sample and process some ore to resolve the economic and operational uncertainties associated with the project, without incurring the environmental degradation associated with road development and use.<sup>21</sup> Nicore would be given five years to stockpile and process the ore (a test plant would have to be identified before any Sampling Plan of Operations would be approved). Five years is expected to provide adequate time to resolve plan uncertainties.

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<sup>21</sup>Uncertainties about the project are documented throughout this EIS. The Surface Use Determination is in Appendix C.

Once the miner completed the sampling, he could submit a new Plan of Operations, with additional economic and operational analysis based on the findings of the sample processing.<sup>22</sup> That plan would be subject to appropriate environmental analysis (information in this EIS would be used and supplemented as needed).

The alternative stockpile site would be used. The stockpile and mine sites would be designed for helicopter maneuver (bucket loading/unloading). The stockpile site would need to be larger in this alternative than in alternatives that haul ore by truck. A minimum of 12 acres would be required for the stockpile site under Alternative 9. A preliminary design showing the basic lay-out of the site was prepared by the BLM and is in the Analysis Files. Several trees would have to be cut to make the area safe for helicopter operations. The BLM has reviewed the area and believes it is an appropriate use the site. The BLM would fulfill all legal survey requirements prior to any ground disturbance. The Illinois Valley Airport could also be used for helicopter servicing, which may reduce the acreage to be cleared at the stockpile site. The powerline road between 199 and the stockpile site would be improved to facilitate moving ore to an unknown location.

Figure 8 shows the vicinity of the sample sites, the stockpile site proposed for Alternative 9, and the flight path between the sample sites and the stockpile site.

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<sup>22</sup>Appendix E discusses the requirements to be met with the sample and lists the information that would need to be included in a future full-scale mining proposal.



## **Alternative 9**

**See FIGURE 8**

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### **ALTERNATIVE 10 - Rock Creek Road, Cable Site “D”, Bench Road Construction, Seasonal Bridges, No Site “A”**

Alternative 10 would approve road access to Sites B and C (one Seasonal Bridge would be placed at Crossing #1). Road access to Site A would not be approved. Access to Site B would be approved via the Wimer Road (4402), Rock Creek Road (461), and Road 445 from the south. Ore could be removed from Mine Site D, but Road 442 would not be approved for ore haul. Instead, a mile-long new road would be constructed to a cable landing in Section 21, about ½ mile due south of the mine site. Ore would be cabled to the landing, then hauled out by trucks via the 445 Road. All routes south of Rough and Ready Creek would be built to accommodate highway legal vehicles to avoid the need for a reload site at the junction of 4402 and 461. Mining equipment (tracked vehicles) could be walked into Site D (see No Action - Existing Condition Map, Figure 3), but the road and stream crossings would not be further developed. Mine Site C would be accessed via the Bench Road. A year-round culvert would be placed at the Wing and Farren ditch. *Figure 9 shows the Alternative 10 haul route.*

Alternative 10 would require approximately 1.4 miles new road construction and 8.8 miles reconstruction. Total haul route is about 14.3 miles. Mitigation described in the Proposed Action and additional mitigation included for all action alternatives would apply to Alternative 10. It would approve the alternative stockpile site.

### **ALTERNATIVE 11 - Private Road, Cable Site “D”, Year-Round Bridge, No Site “A”**

Alternative 11 would approve road access to Sites B and C (a year-round bridge would be placed at Crossing #5). Road access to Site A would not be approved. Ore could be removed from Mine Site D, but Road 442 would not be approved for ore haul. Instead, a mile-long new road would be constructed to a cable landing in Section 21, about ½ mile due south of the mine site. Ore would be cabled to the landing, then hauled north, out the 445 road. Mining equipment (tracked vehicles) could be walked into Site D using existing routes (see No Action - Existing Condition Map, Figure 3), but the road and stream crossings would not be further developed. A year-round culvert would be placed at the National Forest boundary just beyond the Rough and Ready Creek road. No other tributary crossings would be necessary. *Figure 10 shows the Alternative 11 haul route.*

Alternative 11 would require approximately about 1.25 miles new road construction and 6.0 miles reconstruction. Total haul route is about 9.6 miles.

Mitigation described in the Proposed Action and additional mitigation included for all action alternatives would apply to Alternative 11. It would approve the alternative stockpile site.

## **Alternative 10**

[See FIGURE 9](#)

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## **Alternative 11**

**[See FIGURE 10](#)**



## ALTERNATIVES COMPARED

Figure 11 below compares the components of the Proposed Action and its alternatives.

		ALTERNATIVES						
		PA	NA	6	7	8	9	10
<b>Mine Site A Access</b>	Mine Site A Access	Alberg Route	Existing Alberg Route currently impassable <sup>23</sup>	Ridge Route	same as Alt. 6	same as Alt. 6	Helicopter	no
<b>Mine Site B Access</b>	Mine Site B Access	0.25 miles construction up 445 Road	Existing routes are currently impassable in spots	same as PA	same as PA	same as PA	Tracked vehicles only, via Rock Creek Route	Rock Creek Route
<b>Mine Site C Access</b>	Mine Site C Access	Existing 438 Road	Existing route currently inaccessible due to impassable fords.	same as PA	same as PA	same as PA	Helicopter	same as PA
<b>Mine Site D Access</b>	Mine Site D Access	Existing 442 Road	Existing 442 road currently inaccessible due to impassable fords.	same as PA	same as PA	no	Helicopter	1 mi. new road to cable landing
<b>Bench Road Construction</b>	Bench Road Construction	no	no	no	yes	yes	no	yes
<b>Utilizes Rough and Ready Cr. Private Road</b>	Utilizes Rough and Ready Cr. Private Road	no	private route	yes	no	no	no	no
<b>Utilizes Wimer Road/ Rock Creek Route</b>	Utilizes Wimer Road/ Rock Creek Route	no	Rock Creek route currently impassable	no	no	no	limited trips, very minor road work	yes
<b>Crossing 1</b>	Crossing 1	ford	no	no	seasonal bridge	seasonal bridge	no	seasonal bridge
<b>Crossings 2, 3, 4</b>	Crossings 2, 3, 4	ford	no	no	no	no	no	no
<b>Crossing 5</b>	Crossing 5	ford	existing ford currently impassable	seasonal bridge	seasonal bridge	seasonal bridge	no	no

<sup>23</sup>Routes considered “currently impassable” have places that currently cannot be crossed with pickup trucks.



		ALTERNATIVES						
		PA	NA	6	7	8	9	10
<b>Crossing 6, 7</b>	Crossing 6, 7	ford	existing fords currently impassable	seasonal bridge	seasonal bridge	no	no	no
<b>Total Miles of Road Construction</b>	Total Miles of Road Construction	0.55	0	3.8	4.2	4.2	0	1.4
<b>Total Miles of Road Reconstruction</b>	Total Miles of Road Reconstruction	7.70	0	6.1	5.5	4.9	Minor repair Rock Cr Route	8.8
<b>Stockpile Site</b>	Stockpile Site	on powerline near Hwy 199	no	on powerline Near FS Boundary	same as Alt. 6	same as Alt. 6	same as Alt 6, but enlarged to 10 acres	same as Alt. 6
<b>Miles Haul Route</b>	Miles Haul Route	14.3	0	15.5	15.4	13.3	0	14.3

**Figure 11. Alternative Comparison Chart**

## COMPARISON OF ENVIRONMENTAL IMPACTS

The environmental impacts of the Proposed Action and its alternatives are summarized and compared in the discussions below. The analytical basis for these conclusions are in Chapters Three and Four and in the Specialist Reports in the Analysis Files.

### Proposed Action

**Soil Productivity:** The Proposed Action would result in about 83 acres of total disturbance (pit development plus roads).

**Slope Stability:** The Proposed Action includes Mine Site D, the one site at risk of failure.

**Erosion and Sediment:** The Proposed Action is predicted to produce 193 cubic yds of sediment from road development and use.

**Stream Crossings:** The Proposed Action is associated with seven major low-water fords, and nine tributary crossings. About 585 cubic yards of sediment may be delivered to Rough and Ready Creek from the crossings.

***Stream Flow and Water Temperature:*** Implementation of the Proposed Action could lead to the withdrawal of over 40,000 gallons of water each day for dust abatement, given appropriate water rights. This is about 1.5 percent of Rough and Ready Creek's low flow. Resulting temperature increases are not expected to be measurable, but the trend would be toward warmer water due to water withdrawal. Temperature could also increase due to fords and potential disruption of through-flow channels near Crossing #3.

***Nickel Concentrations in the Water:*** The Proposed Action has less new road construction and equal road surfacing requirements as compared to Alternatives 6 and 7. Slight increases are possible but are unlikely to affect public health.

***Hazardous Material Spill:*** The Proposed Action is associated with a greater risk of hazardous material spill than all the alternatives because it has the greatest number of stream crossings and is associated with an estimated 3,390 round trips per year. The overall risk of such a spill is thought to be low.

***Proposed, Endangered, Threatened, and Sensitive Fish:*** The Proposed Action would be associated with a "likely to adversely affect" finding on coho, cutthroat, chinook and steelhead. Eleven factors or indicators would be degraded in the Matrix of Factors and Indicators including water temperature, habitat access, sediment, off-channel habitat, streambank condition, floodplain connectivity, road density, human disturbance, riparian reserves, erosion rates and harassment or incidental take.

***Port-Orford-cedar:*** The Proposed Action crosses Rough and Ready Creek several times and includes two or more routes across the No Name Fan area where there are some large POC. It would also reconstruct the existing Alberg Road, which contains notable POC stocking. The risk is somewhat reduced by limiting operations to the dry season, although no provisions for gating roads are now part of the Plan of Operations. The risk would be highest when roads were wet but passable.

***Noxious Weeds:*** The Proposed Action is associated with the highest risk of introduction and spread of noxious weeds into the project area. It would locate a stockpile site near a known star thistle population and would not adequately limit the spread of these weeds.

***PETS Plants and Botanical Diversity:*** The Proposed Action may impact 15 PETS plant species along the haul route. *Arabis Macdonaldiana*, listed as endangered under the Endangered Species Act, would be affected by this haul route. The Proposed Action would construct 0.3 miles of road in the Rough and Ready Botanical Area with the haul route traversing 3.8 miles within the botanical area and 0.75 miles within the BLM ACEC.

***Aquatic Conservation Strategy/Riparian Reserve Standards and Guidelines:*** The Proposed Action would not meet all elements of the Aquatic Conservation Strategy (ACS) or all the Riparian Reserve Standards and Guidelines. About 4.6 miles of road development in Riparian Reserves, the high number of stream crossings and their design, and use of the Alberg Route are some of the reasons the Proposed Action would not be consistent with the ACS.

***Wild and Scenic River Eligibility:*** The Proposed Action may degrade the current highest potential classification (scenic) in the vicinity of six main stem stream crossings. It is likely to degrade the botanical ORV.

***Operating Costs:*** Road development under the Proposed Action would cost about \$683,000. Haul costs would exceed \$2 million. Dust abatement would cost about \$310,000.

***Economics:*** The Proposed Action is associated with a -\$10.1 million present net value and a cost benefit to cost ratio of 0.58. Economic viability is uncertain.

**Effects on Residents:** The Proposed Action haul route is at least 400 feet from any residence, and the closest mine site is 0.5 miles away. People who cherish solitude would likely be disturbed by increased traffic and activity in the area. All legal requirements related to air and water quality, dust, noise and safety would be met. Property values are expected to increase.

**Visual Quality, Recreation and Interpretive Development:** The Proposed Action would degrade visual quality by developing and using roads. User conflicts would increase as areas currently inaccessible with motorized vehicles would be accessible. Views from the planned Botanical Wayside Interpretive Development would be degraded by the stockpile site.

**Roadless Character:** The roadless character associated with the South Kalmiopsis (SK) area would be degraded by 7 miles of haul roads developed, and 0.25 miles of new construction within the SK.

## **No Action**

**Soil Productivity:** No pits would be developed or ground disturbed. Current levels of recovery would be expected to continue.

**Slope Stability:** No Action does not include Mine Site D.

**Erosion and Sediment:** No Action would not include any new road development, and erosion from existing sources would continue.

**Stream Crossings:** No new stream crossings would be developed. Three low-water fords (Crossings #5, #6 and #7) exist but are currently impassable with pickups due to the presence of large boulders.

**Stream Flow and Water Temperature:** No decreases in low flow or increases in water temperature are expected.

**Nickel Concentrations in the Water:** The concentration of nickel ranges from 11 to 36 parts per billion in samples taken from Rough and Ready Creek, and ranges from 30 to 40 parts per billion in spring samples taken from the O'Brien area. These values exceed Oregon State ambient water standards, but do not pose health risks.

**Hazardous Material Spill:** No Action is associated with the current very low risk of a spill from existing traffic. It would not incur any increased risk.

**Proposed, Endangered, Threatened, and Sensitive Fish:** Several factors are currently in a "marginal" or "outside optimum range" category. Current fish habitat conditions would be maintained.

**Port-Orford-cedar:** The No Action Alternative continues the existing risk of introduction of POC root disease into the analysis area. POC grows along the ditch on the private Rough and Ready Creek road. Residential traffic is likely to import the disease in the foreseeable future. Residents could employ disease control measures such as roadside sanitation to reduce the risk of introduction.

**Noxious Weeds:** Noxious weeds are a current concern in the project area.

**PETS Plants and Botanical Diversity:** Roads currently traverse the Rough and Ready and Oregon Mountain Botanical Areas and BLM Area of Critical Environmental Concern (ACEC). No additional risk to PETS plants would occur.

**Aquatic Conservation Strategy/Riparian Reserve Standards and Guidelines:** Some roads currently contribute sediment to the creek and do not contribute to meeting Aquatic Conservation Strategy guidelines. Otherwise, No Action would be consistent with the ACS and Riparian Reserve Guidelines, as long as it was deemed a legal alternative.

**Wild and Scenic River Eligibility:** No Action would maintain current classifications and ORVs.

**Operating Costs:** No Action would not include road development, haul, cable yarding, dust abatement or gate costs.

**Economics:** No Action has the greatest present net value, which is zero. It also has a benefit to cost-benefit ratio of zero.

**Effects on Residents:** Residents in the project area enjoy solitude and low ambient noise levels. Dust is a current problem on private land. No Action would not degrade the current quality of life. Property values would be expected to increase.

**Visual Quality, Recreation and Interpretive Development:** Current conditions would prevail.

**Roadless Character:** Current roadless character would be maintained. About 60% of the project area is part of the South Kalmiopsis Roadless Area. Several low standard roads currently exist within the Roadless Area.

## **Alternative 6**

**Soil Productivity:** Alternative 6 has the maximum acreage of pits developed (35) and total ground (pits and roads) disturbed (87 acres).

**Slope Stability:** Alternative 6 includes Mine Site D, the one site at risk of failure. The Final Plan of Operations would require geophysical modeling and specific design criteria to assess and minimize the risk.

**Erosion and Sediment:** Alternative 6 is predicted to produce 19 cubic yds of sediment from road development and use.

**Stream Crossings:** Alternative 6 is associated with three seasonal bridges, and three tributary crossings. About 35 cubic yards of sediment may be delivered to Rough and Ready Creek from the crossings (about 6 percent of the amount estimated for the Proposed Action).

**Stream Flow and Water Temperature:** Implementation of the Alternative 6 could use about 43, 600 gallons of water each day for dust abatement, given appropriate water rights. Removal of water would trend the creek toward warmer temperatures but measurable increases are not expected.

**Nickel Concentrations in the Water:** Alternative 6 could result in slight increases in nickel delivered to drinking water but increases are unlikely to affect public health.

**Hazardous Material Spill:** Alternative 6 has similar risk to the Proposed Action; there are far fewer crossings, but it has nearly double the number of round trips, due to smaller 'highway legal' vehicles used. The overall risk of such a spill is thought to be low.

**Proposed, Endangered, Threatened, and Sensitive Fish:** Alternative 6 would be associated with a "likely to adversely affect" finding on coho, cutthroat, chinook and steelhead. Seven factors or indicators would be degraded including sediment, streambank condition, road density, human disturbance, riparian reserves, erosion rates, and incidental take or harassment.

**Port-Orford-cedar:** Alternative 6 includes a haul route along private Rough and Ready Creek Road, which is a high risk area for introducing the disease. The high number of trips through the private land exacerbates the risk. The crossing of No Name Creek is another risk site. Construction of the ridge road could make access from the north (via Parker Creek) possible during the wet season. A Port-Orford-cedar Root Disease Containment strategy (described previously) would be added to the final Plan of Operations. Paving the private road would reduce the risk. The residents along the private road would be encouraged to implement disease control measures.

**Noxious Weeds:** Alternative 6 would include mitigation measures to reduce risk of introduction and spread of noxious weeds into the project area. The alternative stockpile site does not contain known populations of noxious weeds.

**PETS Plants and Botanical Diversity:** Alternative 6 may impact 13 PETS plant species. *Arabis macdonaldiana*, listed as endangered under the Endangered Species Act, would be affected by this haul route. Alternative 6 would traverse 2.9 miles of the Rough and Ready Botanical Area and 0.75 miles of the ACEC. No roads would be constructed within the botanical areas.

**Aquatic Conservation Strategy/Riparian Reserve Standards and Guidelines:** Alternative 6 better meets the elements of the Aquatic Conservation Strategy (ACS) and Riparian Reserve Standards and Guidelines as compared to the Proposed Action. This route has fewer stream crossings and uses temporary bridges, and is associated with less road development in Riparian Reserves.

**Wild and Scenic River Eligibility:** Alternative 6 is not likely to degrade the current highest potential classification (scenic) in the vicinity of the access road. Alternative 6 may degrade the botanical ORV.

**Operating Costs:** Road development under Alternative 6 would cost about \$722,000. Haul costs are about \$2.8 million; about 35% more than the Proposed Action, because smaller trucks would be used, requiring more trips. Dust abatement would cost about \$149,000.

**Economics:** Alternative 6 is associated with a -\$10.6 million present net value. It has a benefit to cost ratio of 0.57 (similar to the Proposed Action). Economic viability is uncertain.

**Effects on Residents:** Alternative 6 would have significant effects on 4 residences (dust, noise) within 100 feet of the haul route. The closest mine site is 0.5 miles away from the closest residence. Some of the effects would be mitigated by paving the private road, and requiring smaller trucks (less noisy). The smaller trucks would result in double the number of trips, however. Legal requirements related to air and water quality, dust, noise, safety, and similar concerns would be met as a condition of the Plan of Operations. Assessed value of private properties along the road are likely to increase with road improvements.

**Visual Quality, Recreation and Interpretive Development:** Alternative 6 would degrade visual quality by developing and using roads. User conflicts would be minimized by closing the area to all but mining-related motorized traffic. The alternative stockpile site would resolve issues with visuals from the Botanical Wayside.

**Roadless Character:** The roadless character associated with the South Kalmiopsis (SK) area would be degraded by 10 miles of haul roads developed, and 5.4 miles of new construction within the SK.

## **Alternative 7**

**Soil Productivity:** Alternative 7 has the maximum acreage of pits developed (35) and total ground (pits and roads) disturbed (87 acres).

**Slope Stability:** Alternative 7 includes Mine Site D, the one site at risk of failure. The Final Plan of Operations would require geophysical modeling and specific design criteria to assess and minimize the risk.

**Erosion and Sediment:** Alternative 7 is predicted to produce 119 cubic yds of sediment from road development and use.

**Stream Crossings:** Alternative 7 is associated with four seasonal bridges, and three tributary crossings. About 39 cubic yards of sediment may be delivered to Rough and Ready Creek from the crossings.

**Stream Flow and Water Temperature:** Implementation of the Alternative 7 could lead to the withdrawal of over 43,000 gallons of water each day for dust abatement, given appropriate water rights. Removal of water would trend the creek toward warmer temperatures but measurable increases are not expected.

**Nickel Concentrations in the Water:** Alternative 7 could result in slight increases in nickel delivered to drinking water but increases are unlikely to affect public health.

**Hazardous Material Spill:** Alternative 7 has less risk than the Proposed Action because there are fewer stream crossings. The overall risk of such a spill is thought to be low.

**Proposed, Endangered, Threatened, and Sensitive Fish:** Alternative 7 would be associated with a “likely to adversely affect” finding on coho, cutthroat, chinook and steelhead. Eight factors or indicators would be degraded in the Matrix of Factors and Indicators including sediment, pool quality, streambank condition, road density, human disturbance, riparian reserves, erosion rates and harassment or incidental take.

**Port-Orford-cedar:** Alternative 7 is associated with fewer risk factors than the Proposed Action or Alternative 6. Alternative 7 constructs the ridge road, which could make access from the north (via Parker Creek) possible during the wet season. It also includes the crossing of No Name Creek on Road 438. A Port-Orford-cedar Root Disease Containment strategy (described previously) would be added to the final Plan of Operations.

**Noxious Weeds:** Alternative 7 would include mitigation measures to reduce risk of introduction and spread of noxious weeds into the project area. The alternative stockpile site does not contain known populations of noxious weeds.

**PETS Plants and Botanical Diversity:** Alternative 6 may impact 15 PETS plant species. *Arabis Macdonaldiana*, listed as endangered under the Endangered Species Act, would be affected by this haul route. The Proposed Action would construct 0.4 miles of roads in the Rough and Ready Botanical Area with the haul route and traverse 3.8 miles within the botanical area. It would also develop 0.75 miles of road in the ACEC.

**Aquatic Conservation Strategy/Riparian Reserve Standards and Guidelines:** Alternative 7 includes approaches and bridges at four stream crossings and Bench Road construction. These elements do not meet the intent of the Aquatic Conservation Strategy. The design of the bridges would mitigate for concerns about fish passage and sediment delivery.

**Wild and Scenic River Eligibility:** Alternative 7 may degrade the current highest potential classification (scenic) in the vicinity of the access road. Alternative 7 may degrade the botanical ORV.

**Operating Costs:** Road development under Alternative 6 would cost about \$693,000 (similar to the Proposed Action). Haul costs are estimated as about \$2.2 million; 7% more than the Proposed Action, because the haul route is longer. Dust abatement would cost about \$222,000.

**Economics:** Alternative 7 is associated with a -\$10.2 million present net value. It has a benefit to cost ratio of 0.57, similar to Alternative 6 and the Proposed Action. Economic viability is uncertain.

**Effects on Residents:** Alternative 7 would have effects similar to the Proposed Action.

**Visual Quality, Recreation and Interpretive Development:** Alternative 7 would degrade visual quality by developing and using roads. The Bench Road would degrade the view for some people living on Rough and Ready Creek Road. User conflicts would be minimized by closing the area to all but mining-related motorized traffic. The alternative stockpile site would resolve issues with visuals from the Botanical Wayside.

**Roadless Character:** The roadless character associated with the South Kalmiopsis (SK) area would be degraded by 10 miles of haul roads developed, and 4.2 miles of new construction within the SK.

## **Alternative 8**

**Soil Productivity:** Alternative 8 has slightly fewer acres of pits developed (33) and less total ground (pits and roads) disturbed (73 acres).

**Slope Stability:** Alternative 8 avoids risk of mining Site D. No other risk to slope stability are predicted.

**Erosion and Sediment:** Alternative 8 is predicted to produce 100 cubic yds of sediment from development and use of the Bench Road.

**Stream Crossings:** Alternative 8 is associated with two seasonal bridges, and two tributary crossings. About 16 cubic yards of sediment may be delivered to Rough and Ready Creek from the crossings (about 3 percent of the amount estimated for the Proposed Action).

**Stream Flow and Water Temperature:** Implementation of the Alternative 8 could lead to the withdrawal of about 37,500 gallons of water each day for dust abatement, given appropriate water rights. Removal of water would trend the creek toward warmer temperatures but measurable increases are not expected.

**Nickel Concentrations in the Water:** Alternative 8 could result in slight increases in nickel delivered to drinking water but increases are unlikely to affect public health. It is associated with less roading than Alternative 7 and the Proposed Action.

**Hazardous Material Spill:** Alternative 8 has less risk than the Proposed Action; there are far fewer crossings and fewer trips. The overall risk of such a spill is thought to be low.

**Proposed, Endangered, Threatened, and Sensitive Fish:** Alternative 8 would be associated with a “likely to adversely affect” finding on coho, cutthroat, chinook and steelhead. Eight factors or indicators would be degraded including sediment, streambank condition, pool character and quality road density, human disturbance, riparian reserves, erosion rates, and incidental take or harassment.

**Port-Orford-cedar:** Alternative 8 is associated with risk similar to Alternative 7. The road to Site D would be eliminated, but that route does not have significant populations of POC.

**Noxious Weeds:** Alternative 8 would include mitigation measures to reduce risk of introduction and spread of noxious weeds into the project area. The alternative stockpile site does not contain known populations of noxious weeds.

**PETS Plants and Botanical Diversity:** Alternative 8 may impact 15 PETS plant species, but would impact fewer sites than Alternative 7 (there are about 30 plant sites on the road to Mining Site D).

*Arabis macdonaldiana*, listed as endangered under the Endangered Species Act, would be affected by this haul route. The Proposed Action would construct 0.4 miles of roads in the Rough and Ready Botanical Area with the haul route traversing 2.8 miles within the Rough and Ready Botanical area and 0.75 miles in the ACEC.

**Aquatic Conservation Strategy/Riparian Reserve Standards and Guidelines:** Alternative 8 would not meet all elements of the Aquatic Conservation Strategy (ACS) and Riparian Reserve Standards and Guidelines. This route has fewer stream crossings and uses temporary bridges, but is associated with the Bench Road construction within riparian reserves.

**Wild and Scenic River Eligibility:** Alternative 8 is not likely to degrade the current highest potential classification (scenic) in the vicinity of the access road. Alternative 8 would have fewer effects on the botanical ORV's by avoiding development of the road to Site D.

**Operating Costs:** Road development under Alternative 8 would cost about \$580,000. Haul costs would exceed \$2.1 million; similar to the Proposed Action. Dust abatement would cost about \$222,000.

**Economics:** Alternative 8 is associated with a -\$9.5 million present net value and a 0.57 benefit to cost ratio. Economic viability is uncertain.

**Effects on Residents:** Alternative 8 would have effects similar to the Proposed Action and Alternative 7.

**Visual Quality, Recreation and Interpretive Development:** Alternative 8 would degrade visual quality by developing and using roads. User conflicts would be minimized by closing the area to all but mining-related motorized traffic. The alternative stockpile site would resolve issues with visuals from the Botanical Wayside.

**Roadless Character:** The roadless character associated with the South Kalmiopsis (SK) area would be degraded by 9 miles of haul roads developed, and 4.2 miles of new construction within the SK.

## **Alternative 9**

**Soil Productivity:** Alternative 9 would have little impact on soil productivity (about 5 acres would be disturbed).

**Slope Stability:** Alternative 9 incurs no risk to slope stability.

**Erosion and Sediment:** Alternative 9 is similar to the No Action alternative.

**Stream Crossings:** Alternative 9 would approve a limited number of fords with tracked vehicles to facilitate sampling; little sediment would be delivered at the crossings.

**Stream Flow and Water Temperature:** Alternative 9 would use far less water than other action alternatives. No temperature increases are likely.

**Nickel Concentrations in the Water:** Alternative 9 would not result in any appreciable exposure of peridotite rock, therefore no increases beyond natural are expected.

**Hazardous Material Spill:** Alternative 9 has very low risk of hazardous fluid spill.

**Proposed, Endangered, Threatened, and Sensitive Fish:** Alternative 9 would be associated with a “NOT likely to adversely affect” finding on coho, cutthroat, chinook and steelhead.

**Port-Orford-cedar:** Alternative 9 is similar to the No Action alternative. A POC Containment Strategy is shown in Appendix J for the Preferred Alternative. This strategy is likely to be effective in maintaining current risk.

**Noxious Weeds:** Alternative 9 would locate the stockpile site away from noxious weeds. Use of helicopters versus trucks significantly decreases the risk of spreading weeds to the mine sites and along haul routes. Risks of spreading weeds would be low. Helicopters would not land at any mine sites. Mitigation is in place to reduce or eliminate risks. Monitoring for the spread of noxious weeds would be required.

**PETS Plants and Botanical Diversity:** Alternative 9 would impact one species of PETS plants. Sampling would be designed to minimize impacts on this species.

**Aquatic Conservation Strategy/Riparian Reserve Standards and Guidelines:** Alternative 9 would maintain the existing condition relative to Aquatic Conservation Strategy (ACS) and Riparian Reserve Standards and Guidelines. It best meets the ACS of all the action alternatives.

**Wild and Scenic River Eligibility:** Alternative 9 would not degrade the current highest potential classification (scenic) or ORV's.

**Operating Costs:** Road development under Alternative 9 would cost about \$43,000. Haul costs are estimated as \$840,000 for a helicopter to move 5,000 tons of ore from the mine sites to the stockpile site. Dust abatement would cost about \$1000.

**Economics:** Alternative 9 is associated with a -\$970,000 present net value. It has a benefit to cost ratio of 0.1 (less than the Proposed Action and other action alternatives).

**Effects on Residents:** Alternative 9 would have short-term, intense effects (noise) on residents while operations occur. The flight path would remain 1,000 feet from any non-mining related buildings. All legal requirements related to air and water quality, safety, and noise would be met.

**Visual Quality, Recreation and Interpretive Development:** Alternative 9 would maintain existing character. The alternative stockpile site would resolve issues with visuals from the Botanical Wayside.

**Roadless Character:** Alternative 9 would maintain the existing roadless character of the SK.



## Alternative 10

**Soil Productivity:** Alternative 10 would disturb about 85 acres of road and mine pit development.

**Slope Stability:** Alternative 10 includes Mine Site D, the one site at risk of failure. The Final Plan of Operations would require geophysical modeling and specific design criteria to assess and minimize the risk.

**Erosion and Sediment:** Alternative 10 is predicted to produce 154 cubic yds of sediment from development and use of Wimer and Rock Creek roads and the Bench Road.

**Stream Crossings:** Alternative 10 is associated with one temporary bridge and one tributary crossing. About 5 cubic yards of sediment may be delivered to Rough and Ready Creek from the crossings.

**Stream Flow and Water Temperature:** Implementation of Alternative 10 could lead to the withdrawal of about 40,000 gallons of water each day for dust abatement, given appropriate water rights. Removal of water would trend the creek toward warmer temperatures but measurable increases are not expected.

**Nickel Concentrations in the Water:** Alternative 10 could result in slight increases in nickel delivered to drinking water but increases are unlikely to affect public health. Reducing new road construction and the total distance of haul would reduce the area exposed to fresh weathering and subsequent nickel delivery.

**Hazardous Material Spill:** Alternative 10 has less risk than the Proposed Action because there are far fewer crossings. The overall risk of such a spill is thought to be low.

**Proposed, Endangered, Threatened, and Sensitive Fish:** Alternative 10 would be associated with a “likely to adversely affect” finding on coho, cutthroat, chinook and steelhead. Eight factors or indicators would be degraded including sediment, streambank condition, pool character and quality, road density, human disturbance, riparian reserves, erosion rates, and incidental take or harassment.

**Port-Orford-cedar:** Alternative 10 would increase the risk of spreading the disease to healthy populations of POC above the Wimer Road toward Site B. Other risk factors are eliminated. A Port-Orford-cedar Root Disease Containment strategy (described previously) would be added to the final Plan of Operations.

**Noxious Weeds:** Alternative 10 would include mitigation measures to reduce risk of introduction and spread of noxious weeds into the project area. Risks would be higher than Alternatives 7 and 8 because the haul route would traverse the Wimer Road with its serious population of scotch broom. The alternative stockpile site does not contain known populations of noxious weeds.

**PETS Plants and Botanical Diversity:** Alternative 10 may impact 17 sensitive species of PETS plants, more than any other alternative. *Arabis macdonaldiana*, listed as endangered under the Endangered Species Act, would be affected by this haul route. The Proposed Action would construct 0.4 miles of roads in the Rough and Ready Botanical Area with the haul route traversing 3.5 miles within the two FS botanical areas. The haul route would also include 0.75 miles within the BLM ACEC.

**Aquatic Conservation Strategy/Riparian Reserve Standards and Guidelines:** Alternative 10 better meets the elements of the Aquatic Conservation Strategy (ACS) and Riparian Reserve Standards and Guidelines as compared to the Proposed Action and Alternatives 6 and 7. It is associated with less road development in Riparian Reserves. However, it does include the Bench Road, which does not meet the intent of all Riparian Reserve Standards and Guidelines.

**Wild and Scenic River Eligibility:** Alternative 10 would maintain Rough and Ready Creek’s Wild and Scenic River eligibility although it may degrade some botanical values.

**Operating Costs:** Road development under Alternative 10 would cost about \$770,000. Haul costs are estimated as about \$870,000. Dust abatement would cost about \$363,000. Alternative 10 would also include the \$1.6 million dollar cable ore-hauling operation from Site D.

**Economics:** Alternative 10 is associated with a -\$9.0 million present net value and a benefit to cost ratio of 0.55; economic viability is uncertain.

**Effects on Residents:** Alternative 10 would have intense effects on the residents who live at the 22 homes within 100 feet of the Wimer Road. The closest mine site is 0.5 miles away from the closest residence. Some of the effects would be mitigated by increased surfacing on the Wimer road, and requiring smaller trucks (less noisy). The smaller trucks would result in double the number of trips, however. Legal requirements related to air and water quality, dust, noise, safety, and similar concerns would be met as a condition of the Plan of Operations. Assessed value of private properties along the road are likely to increase with road improvements.

**Visual Quality, Recreation and Interpretive Development:** Alternative 10 would degrade visual quality by developing and using roads. The Bench Road would be immediately visible from a few residents. User conflicts would be minimized by closing the area to all but mining-related motorized traffic. The alternative stockpile site would resolve issues with visuals from the Botanical Wayside.

**Roadless Character:** The roadless character associated with the South Kalmiopsis (SK) area would be degraded by 6 miles of haul roads developed, including a mile of new construction, and the cable operation.

## **Alternative 11**

**Soil Productivity:** Alternative 11 reduces the total ground disturbance to 58 acres.

**Slope Stability:** Alternative 11 includes Mine Site D, the one site at risk of failure. The Final Plan of Operations would require geophysical modeling and specific design criteria to assess and minimize the risk.

**Erosion and Sediment:** Alternative 11 resolves this issue by eliminating all high risk road segments.

**Stream Crossings:** Alternative 11 is associated with one Rough and Ready Creek crossing (#5) and which would be designed as a year-around bridge. It also would have three tributary crossings. About 12 cubic yards of sediment may be delivered to Rough and Ready Creek from the crossings.

**Stream Flow and Water Temperature:** Implementation of Alternative 11 lead to the withdrawal of about 27,000 gallons of water each day for dust abatement, given appropriate water rights. Removal of water would trend the creek toward warmer temperatures but measurable increases are not expected.

**Nickel Concentrations in the Water:** Alternative 11 could result in slight increases in nickel delivered to drinking water but increases are unlikely to affect public health. Reducing new road construction and the total distance of haul would reduce the area exposed to fresh weathering and subsequent nickel delivery.

**Hazardous Material Spill:** Alternative 11 has fewer risks than the Proposed Action and Alternatives 6, 7, 8, and 10 (it is associated with fewer trips and only one major stream crossing). The overall risk of such as spill is thought to be low.

**Proposed, Endangered, Threatened, and Sensitive Fish:** Alternative 11 would be associated with a “likely to adversely affect” finding on coho, cutthroat, chinook and steelhead. Six factors or indicators would be degraded including sediment, road density, human disturbance, riparian reserves, erosion rates, and incidental take or harassment.

**Port-Orford-cedar:** Alternative 11 includes a haul route along the private Rough and Ready Creek Road, which is a high risk area for introducing the disease. The crossing of No Name Creek is another risk site. A Port-Orford-cedar Root Disease Containment strategy (described previously) would be added to the final Plan of Operations. The residents along the private road would be encouraged to agree on disease control measures. The use of a year-around bridge would increase the risk of use of the road system while it is wet.

**Noxious Weeds:** Alternative 11 would include mitigation measures to reduce risk of introduction and spread of noxious weeds into the project area. The alternative stockpile site does not contain known populations of noxious weeds.

**PETS Plants and Botanical Diversity:** Alternative 11 may impact 12 sensitive species. *Arabis macdonaldiana*, listed as endangered under the Endangered Species Act, would be affected by this haul route. Alternative 11 would avoid all road construction within Rough and Ready Botanical Area. The haul route would traverse 1.9 miles within the botanical area (the least of the operational mining alternatives).

**Aquatic Conservation Strategy/Riparian Reserve Standards and Guidelines:** Alternative 11 better meets the elements of the Aquatic Conservation Strategy (ACS) and Riparian Reserve Standards and Guidelines as compared to the Proposed Action and Alternatives 6, 7, 8, and 10. This route has fewer stream crossings and uses a permanent bridge, and is associated with the least amount of haul within Riparian Reserves. It would require culverts at three tributary crossings.

**Wild and Scenic River Eligibility:** Alternative 11 is likely to maintain current eligibility of the creek, although it may degrade some botanical values.

**Operating Costs:** Road development under Alternative 11 would cost about \$700,000. Haul costs are estimated as \$970,000. Dust abatement would cost about \$149,000. Alternative 11 would also include the \$1.6 million dollar cable ore-hauling operation from Site D.

**Economics:** Alternative 11 is associated with a -\$7.5 million present net value and a benefit to cost ratio of 0.59 (best benefit to cost ratio as compared to the Proposed Action and all other action alternatives); economic viability is uncertain.

**Effects on Residents:** Alternative 11 would have significant effects on 4 residences (dust, noise) within 100 feet of the haul route. The closest mine site is 0.5 miles away from the closest residence. Some of the effects would be mitigated by paving the private road. Larger, noisier trucks would be used but the number of trips would be about one-third the amount estimated for Alternative 6. Legal requirements related to air and water quality, dust, noise, safety, and similar concerns would be met as a condition of the Plan of Operations. Assessed value of private properties along the road are likely to increase with road improvements.

**Visual Quality, Recreation and Interpretive Development:** Alternative 11 would degrade visual quality by developing and using roads. User conflicts would be minimized by closing the area to all but mining-related motorized traffic. The alternative stockpile site would resolve issues with visuals from the Botanical Wayside.

**Roadless Character:** The roadless character associated with the South Kalmiopsis (SK) area would be degraded by one mile of road construction to the cable landing site and the development of 5 miles of road within the SK. Alternative 11 reduces the haul route within the SK by half as compared to Alternative 7.

# ALTERNATIVE 10

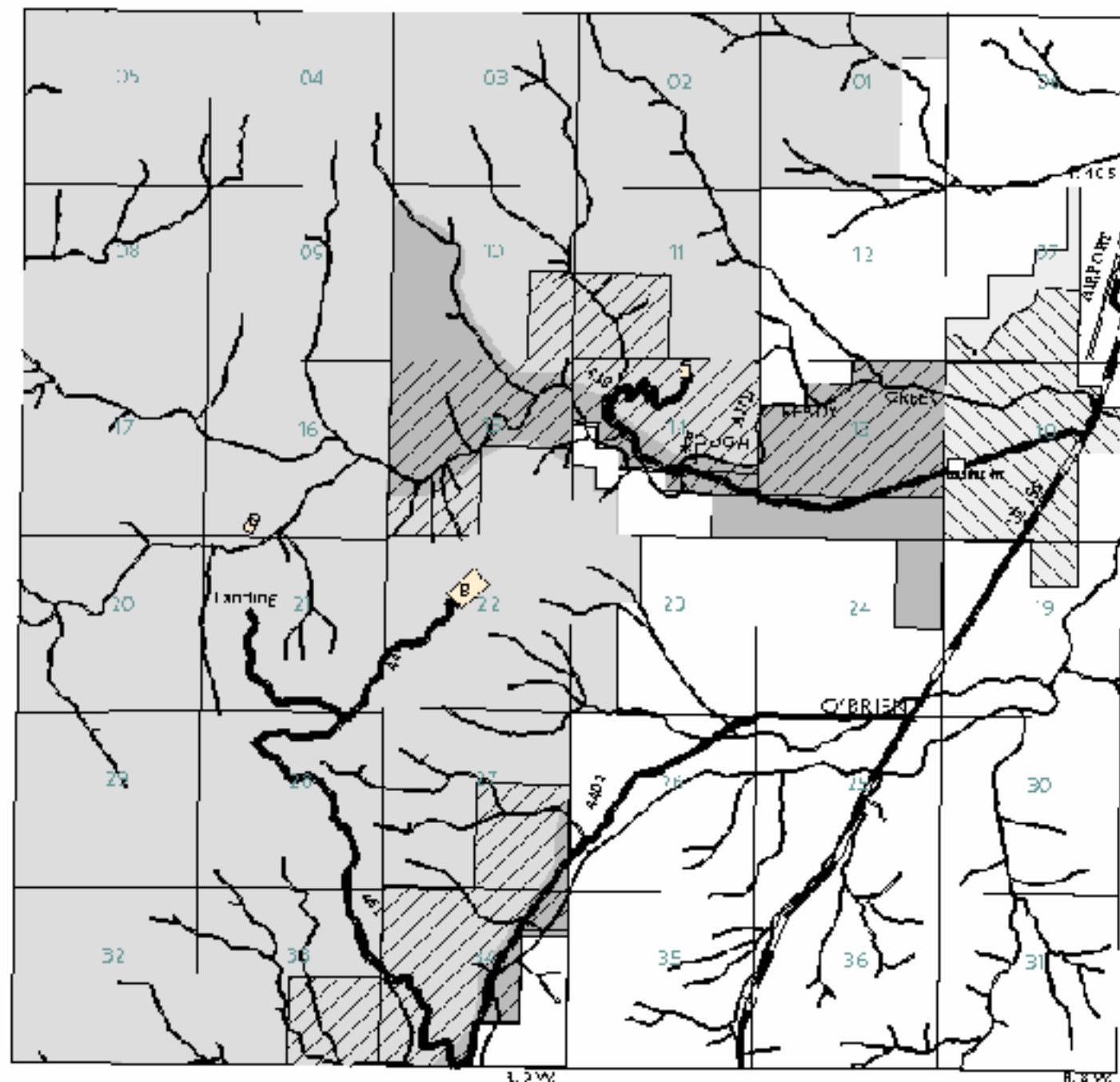
Feed to site C, Cable Drop in

## LEGEND

-  National Forest Lands
-  National Forest-Inward Roadless Area
-  Bureau of Land Mgmt
-  State and Private Lands
-  USFS Retention Area
-  BLM Area of Critical Environmental Concern
-  Streams
-  US 195
-  Project Roads
-  Proposed Stream Crossing



Figure 9



# ALTERNATIVE II

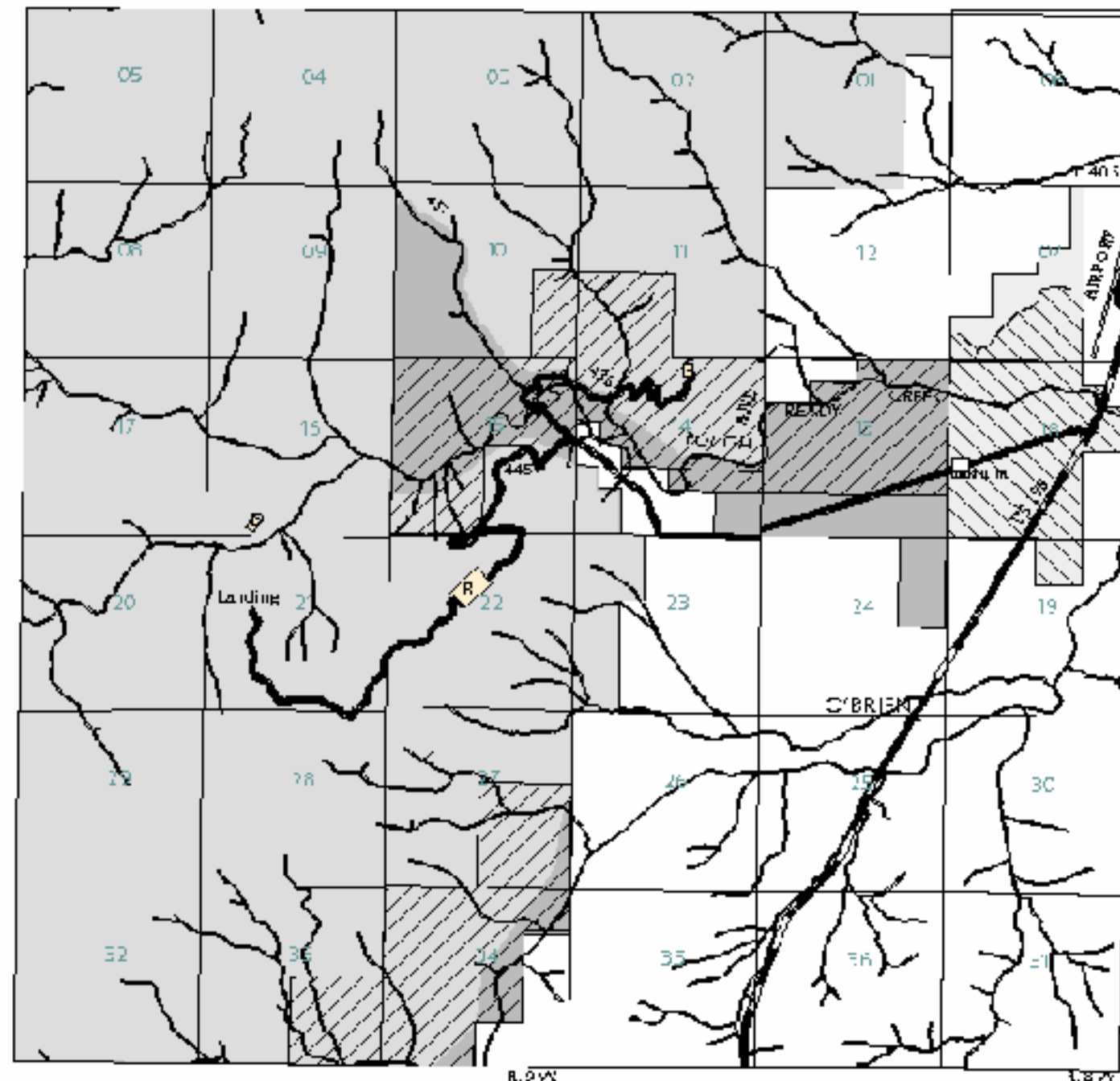
For Access, Perm. Bridge

## LEGEND

-  National Forest Lands
-  National Forest: Invasive  
Woodless Area
-  Bureau of Land Mgmt
-  State and Private Lands
-  USFS Botanical Area
-  BLM Area of Critical  
Environments Concern
-  Streams
-  US 199
-  Project Road
-  Proposed Stream Crossing






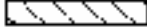






Figure 10



# ALTERNATIVE 9 HELICOPTER SAMPLES

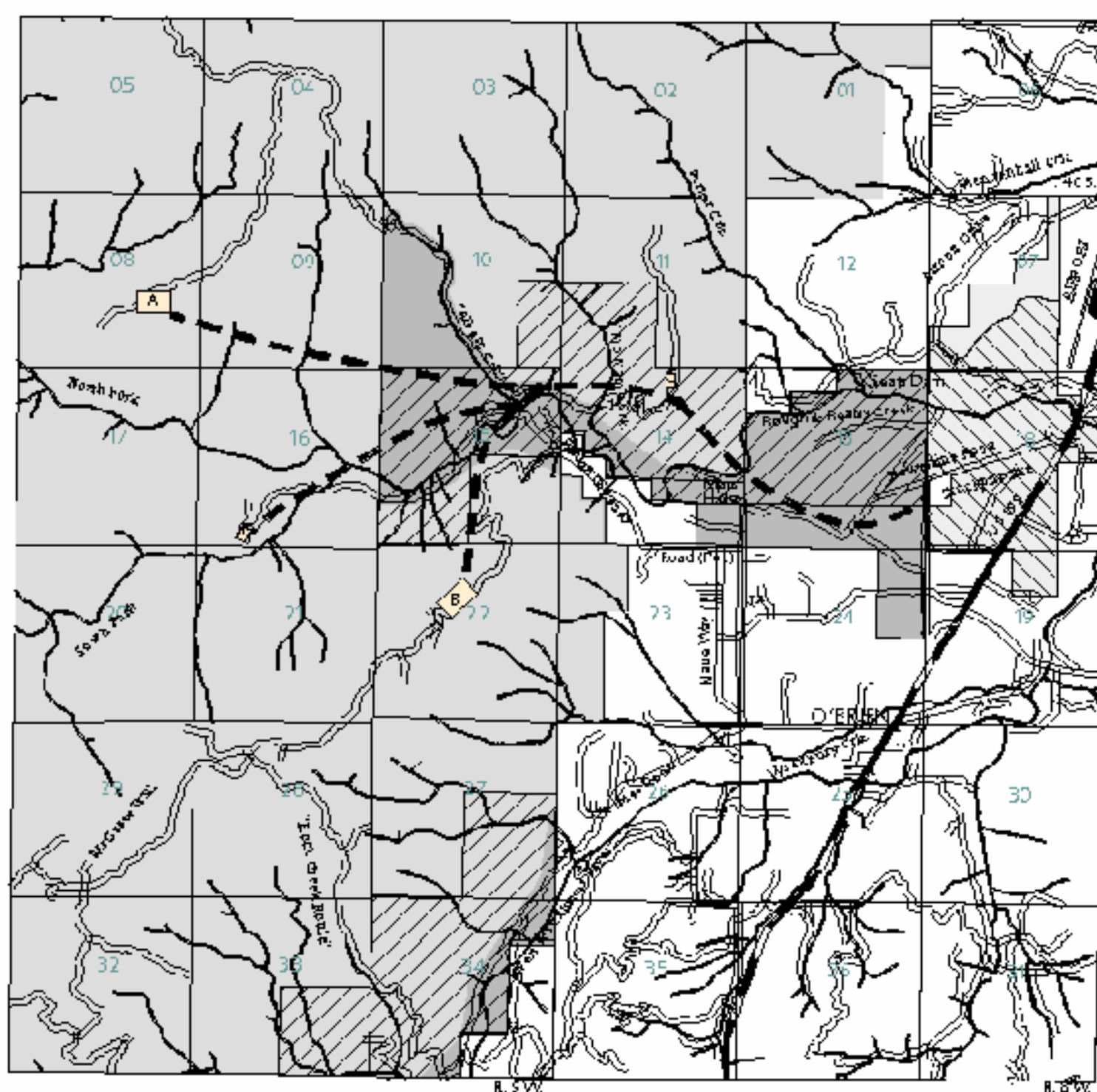
## LEGEND

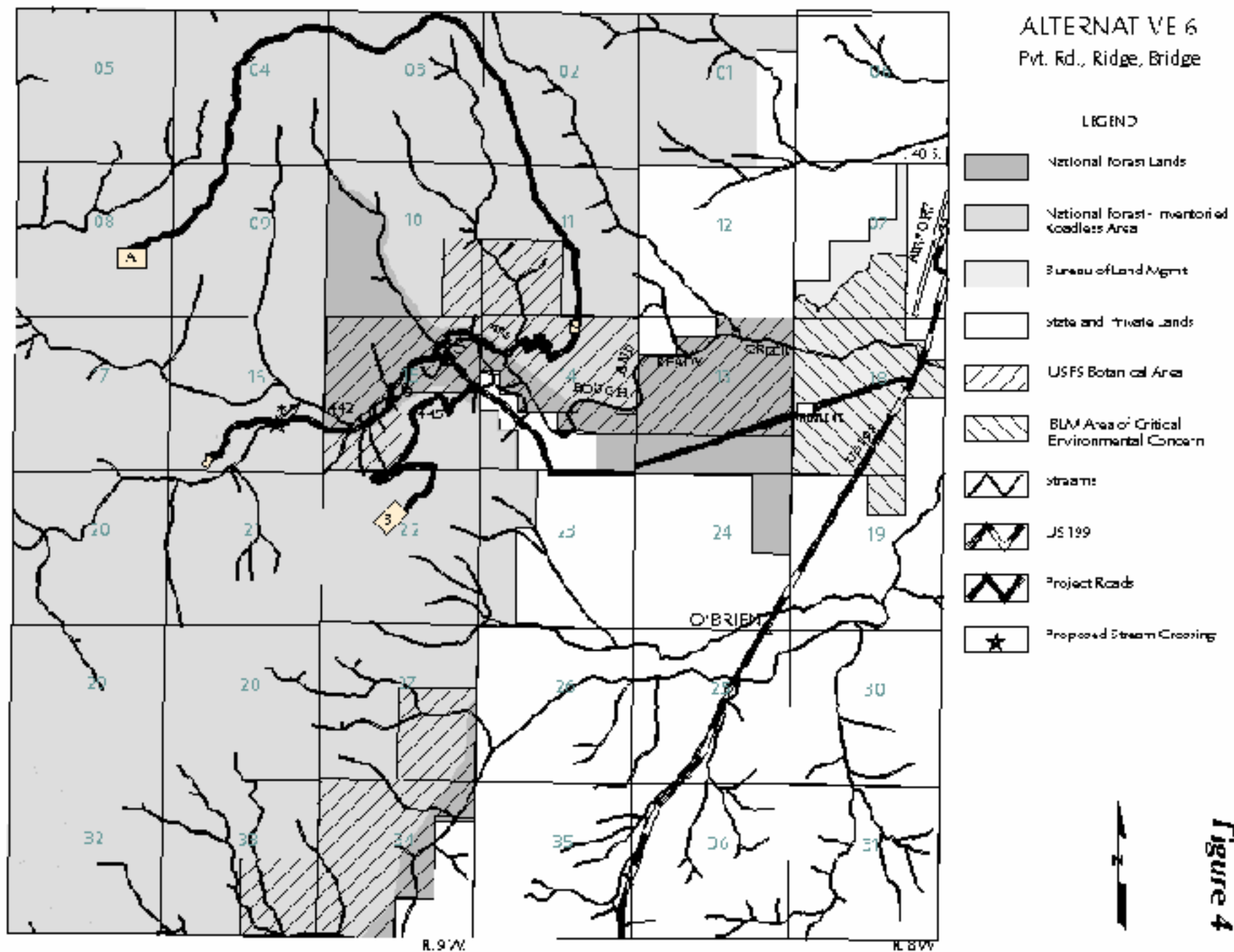
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-  National Forest - Inventoried Roadless Area
-  Bureau of Land Mgmt
-  State and Private Lands
-  USFS Botanical Area
-  BLM Area of Critical Environmental Concern
-  Streams
-  US 199
-  Existing Roads
-  Flight Routes

Scale: 1:53355



Figure 8





**Figure 4**



# ALTERNATIVE / Bench, Ridge, Bridge

## LEGEND

-  National Forest Lands
-  National Forest - Improved Roadless Area
-  Bureau of Land Mgmt
-  State and Private Lands
-  USFS Botanical Area
-  BLM Area of Critical Environmental Concern
-  Stream
-  US 199
-  Project Roads
-  Proposed Stream Crossing

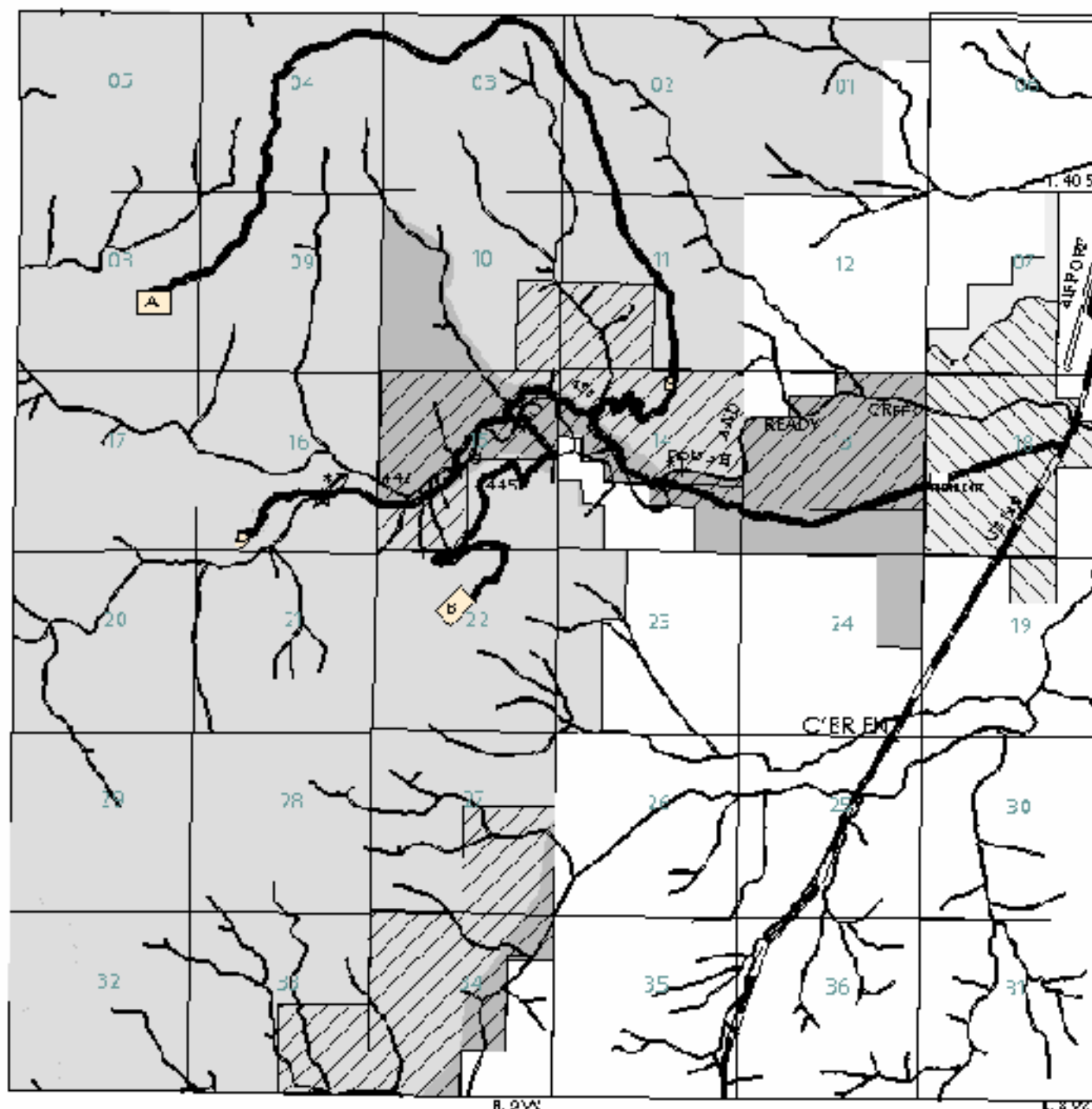









Figure 5



# ALTERNATE 8

No. 1 Site

## LEGEND

-  National Forest Lands
-  National Forest - Inventoried Roadless Area
-  Bureau of Land Mgmt
-  State and Private Lands
-  USFS Botanical Area
-  BLM Area of Critical Environmental Concern
-  Streams
-  US 159
-  Project Roads
-  Proposed Stream Crossing

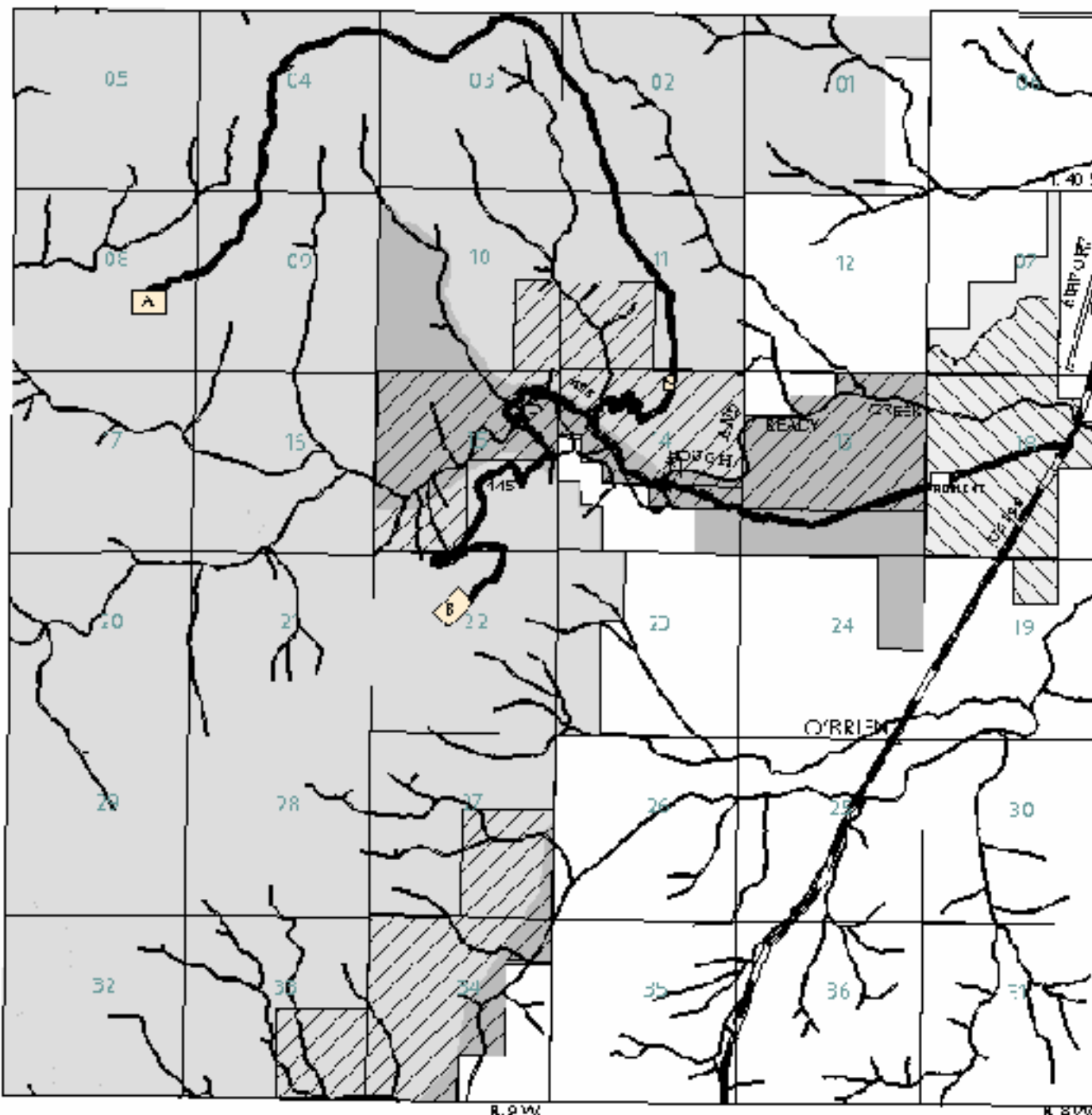
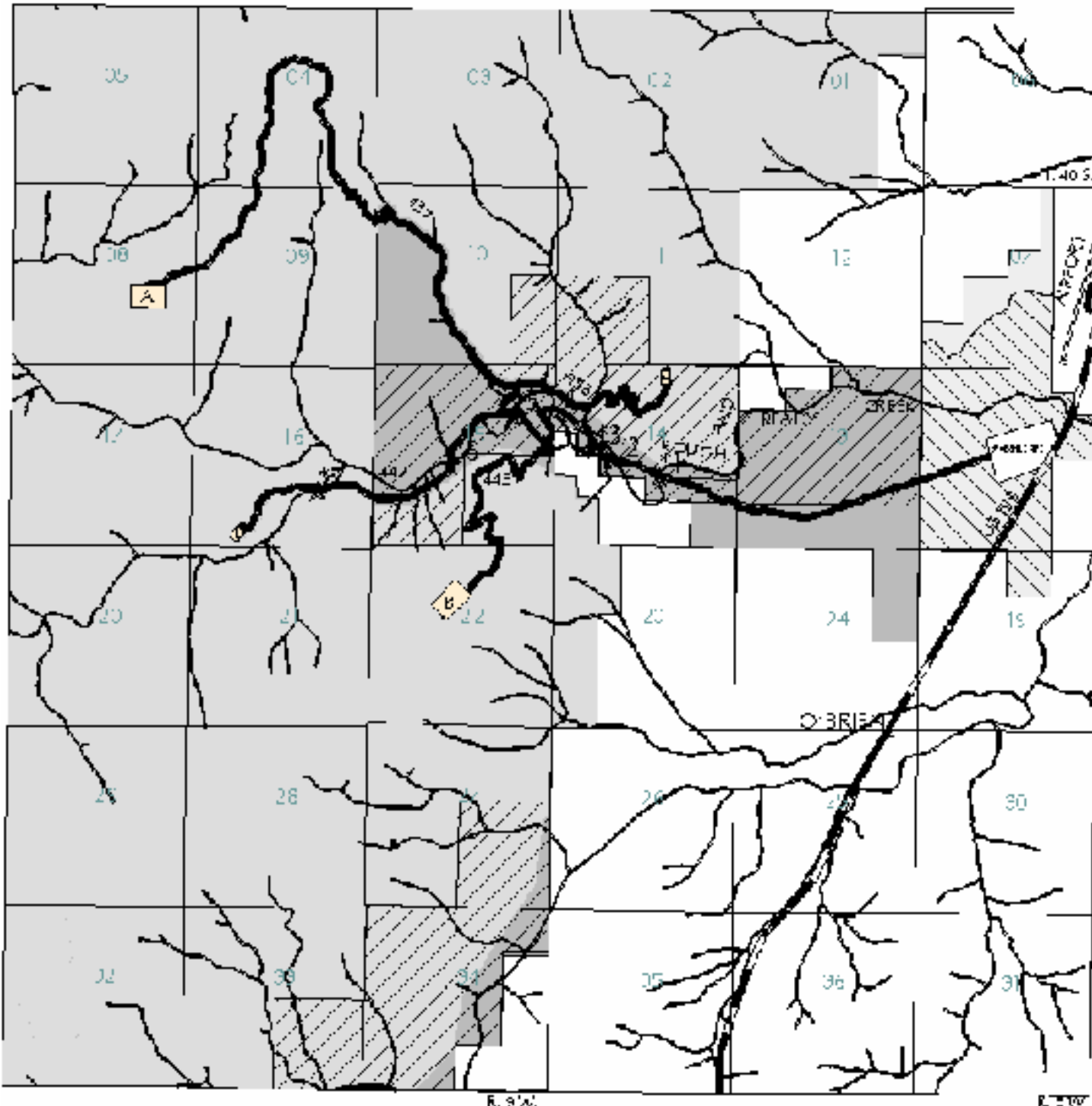


Figure 6

# PROPOSED ACTION







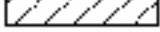




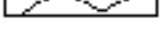
- LSCBND
- National Forest Lands
  - National Forest - over forest Roadless Area
  - Bureau of Land Mgmt.
  - State and Private Lands
  - USFS Botanical Area
  - BLM Area of Critical Environmental Concern
  - Streams
  - US 199
  - Project Roads
  - Proposed Stream Crossing



Figure 2

# NO ACTION EXISTING CONDITION

## LEGEND

-  National Forest Lands
-  National Forest - Inventoried Roadless Area
-  Bureau of Land Mgmt
-  State and Private Lands
-  USFS Botanical Area
-  ELM Area of Critical Environmental Concern
-  Streams
-  US 129
-  Existing Roads
-  Contour Lines

Scale: 1:53356



**Figure 3**

